

# Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)



## **M. Sc. (Computer Science)**

**(w.e.f. 2023-2024)**

**Program Code: MSCITR104**

### **PROGRAMME OUTCOMES (POs):**

After the completion of the program students will be able to:

**PO-1:** Understand use of advanced computing techniques and tools.

**PO-2:** Understand and apply programming knowledge to solve complex problems not just by using technology, but also to contribute in creation of new & emerging technologies which meet the desired needs of industry and society.

**PO-3:** Understand the impact of technology & its applications and provide solutions to the end user in a cost effective and efficient manner.

**PO-4:** To adapt existing design patterns, techniques, algorithms, data structures, etc. to solve real world problems.

**PO-5:** Understand the impact of IT related solutions in socioeconomic context.

**PO-6:** Build a strong foundation for research in future & emerging technological trends.

**PO-7:** Emphasize on life-long learning considering the ever changing technological environment.

**PO-8:** To develop, a real world application.

**PO-9:** Understand advanced emerging techniques and to apply there in real world application.

**PO-10:** Carry on research based project and to develop commercial projects.

(As approved by AC and EC meetings held on 16.08.2023 and 18.04.2023 respectively)



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## Scheme of M.Sc. (Computer Science) under Semester System Program Code: MSCCSRI04

Semester	Course Code	Subject Name	Credit			Total Credit	Marks			
			L	T	P		ESE	IA	Total	
									Max	Min
First	CST101	Computer System Architecture	3	1	-	4	80	20	100	36
	CST102	Data Communication and Computer Network	3	1	-	4	80	20	100	36
	CST103	Object Oriented Programming with Java	3	1	-	4	80	20	100	36
	CST104	Operating Systems	3	1	-	4	80	20	100	36
	CSP101	Lab 1: Programming in Java	-	-	2	2	-	-	100	36
	CSP102	Lab 2: Operating Systems (Unix, Linux & Android)	-	-	2	2	-	-	100	36
	<b>Subtotal</b>			<b>12</b>	<b>4</b>	<b>4</b>	<b>20</b>	-	-	<b>600</b>
Second	CST201	Relational Database Management System	3	1	-	4	80	20	100	36
	CST202	Data Structure	3	1	-	4	80	20	100	36
	CST203	Software Engineering	3	1	-	4	80	20	100	36
	CST204	Elective-I: Computer Graphics								
	CST205	Elective-I: Introduction to Block chain Technology	3	1	-	4	80	20	100	36
	CST206	Elective-I: Cryptography and Network Security								
	CSP201	Lab 3: Relational Database Management System	-	-	2	2	-	-	100	36
	CSP202	Lab 4: Data Structure	-	-	2	2	-	-	100	36
<b>Subtotal</b>			<b>12</b>	<b>4</b>	<b>4</b>	<b>20</b>	-	-	<b>600</b>	

**Note:** Students have to opt one paper from the pool of Elective-I of 2<sup>nd</sup> Semester, one paper from the pool of Elective-II of 3<sup>rd</sup> Semester and one paper from the pool of Elective-III of 4<sup>th</sup> Semester.

**Abbreviations used:**

**ESE:** End Semester Exam

**IA:** Internal Assessment



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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: First	Year: I	w.e.f.: 2023-2024
1. Course Code	CST-101		
2. Course Title	Computer System Architecture		
3. Course Type	Theory		
4. Pre-requisite (if any)	No		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Provide with a deep understanding of the fundamental principles and concepts behind the design and organization of digital computer.</li><li>• Understand the fundamental concepts of digital computer organization and architecture.</li><li>• Develop a basic understanding of the building blocks of a digital computer system.</li><li>• Enable understanding of how these building blocks are organized together to architect a digital computer system.</li><li>• Enable understanding of how various functional units of a digital computer system interacts to meet the processing requirements of the user.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Digital Logic Circuit:</b> Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits: Adder, Binary Adder-Subtractor, Decoders, Multiplexers, Sequential Circuits: Flip Flops, Registers, Shift Registers, Binary Counters. <b>Data Representation:</b> Data Types, Complements, Fixed Point Representation, Floating Point Representation, Binary Codes.	12
II.	<b>Register Transfer and Micro-operations:</b> Register Transfer Language, register transfer, Bus and Memory Transfer; Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit. <b>Basic Computer Organization:</b> Instruction codes, Stored Program Organization, Computer Registers – Common Bus System; Computer Instructions – Instruction Set Completeness; Instruction Cycle – Fetch and Decode, Determine the Type of Instruction, Register-Reference Instructions; Memory Reference Instructions; Input-Output and Interrupt.	12
III.	<b>Programming the Basic Computer:</b> Machine Language, Assembly Language, Introduction to Assembler, Program Loops, Programming Arithmetic and Logic Operations <b>Micro programmed Control:</b> Control Memory, Address Sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Micro program Example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, Fetch Routine, Symbolic Micro program,	12



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	Binary Micro program, Design of Control Unit – Micro program Sequencer	
IV.	<b>Central Processing Unit:</b> Introduction, General Register Organization, Stack Organization, Evaluation of Arithmetic Expressions, Instruction Formats – Three-, Two-, One- and Zero-Address Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of Interrupt, RISC & CISC Characteristics, Overlap Register Window <b>Pipeline and Vector Processing:</b> Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors	12
V.	<b>Input-Output Organization:</b> Peripheral Devices, Input-Output Interface, Modes of Transfer – Programmed I/O, Interrupt-Driven I/O, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication <b>Memory Organization:</b> Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Computer System Architecture, by M. Morris Mano, Third Edition. 2007. Low Price Edition. Pearson Education
2. Computer Architecture and Organization, by John P. Hayes. Third Edition. 2017. McGraw Hill Publication.
3. Computer Organization and Architecture: Designing for Performance, by William Stallings. Tenth Edition. 2016. Pearson Education India.

### Reference Books:

1. "Computer Organization and Design" by David A. Patterson and John L. Hennessy
2. Structured Computer Organization, A. S. Tanenbaum, Pearson Education.
3. Fundamentals of Computer Organization, P. Dandamudi, Springer.
4. Computer Architecture & Parallel processing - Kai Hwang 7 Briggs. (MGH).

### E-Resources:

1. **Computer system architecture**  
<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==>
2. **Computer architecture**  
[https://onlinecourses.nptel.ac.in/noc20\\_cs25/preview](https://onlinecourses.nptel.ac.in/noc20_cs25/preview)
3. **Computer Architecture free course coursera link**  
<https://www.coursera.org/learn/comparch>
4. **Unacademy Computer Architecture Course link**  
<https://www.youtube.com/watch?v=zMkye9iaWB4&list=PLG9aCp4uE-s3WzvFWInI-7hHWNC8s2Rdl>

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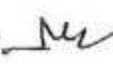





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9. **Dr. Manu Sood** - Member  
Prof., Dept. of Computer Science  
Himachal Pradesh University, Shimla (Himachal Pradesh)  
(Approved Online)





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## Part A: Introduction

Program: M.Sc. (C.S.)		Semester: First	Year: I	w.e.f.: 2023-2024
1.	Course Code	CST-102		
2.	Course Title	Data Communication and Networking		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	No		
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 basic computer network technology</li> <li>In depth understanding of principals, protocols, technologies of computer network.</li> <li>Understand and explain the data communication system and its components.</li> <li>Identify the different types of network topologies and protocols.</li> <li>Understand the layers of the OSI model and TCP/IP.</li> <li>Expose wireless and wired LANs.</li> </ul>		
6.	Credit Value	Theory: 4		
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

## Part B: Content of the Course

Unit	Topics	Total Hours
I.	<b>Overview of Data Communication and Networking:</b> Data Communications: components, data representation, direction of data flow (simplex, half duplex, full duplex; Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN), Protocol and standards; Reference Models: OSI & TCP/IP reference model comparative study.	12
II.	<b>Physical layer:</b> Analog and Digital Transmission: Transmission Impairments, Data Rates Limits, Digital to Digital Conversion, Digital to Analog conversion, Analog To Digital Conversion: Modulation, Transmission Modes, Parallel, Serials Asynchronous and Synchronous communication; Constellation Diagram, Analog to Analog conversion, Bandwidth Utilization, Transmission Media: Multiplexing: FDM, WDM AND TDM, Guided Media: Twisted Pair, Coaxial and Fiber Optic, Unguided Media : Wireless , Radio Waves, Microwaves and Infrared.	12
III.	<b>Data Link Layer:</b> Flow control: Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC; Medium Access Sub-layer: Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Multiple Access Protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, Fast Ethernet.	12
IV.	<b>Network Layer:</b> Networking and Internetworking Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: Internet address, classful address, subnetting, classless address; Routing: Techniques, static vs dynamic routing, and routing table for classful address; Routing Algorithms: Shortest path algorithm,	12

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	flooding, distance vector routing , link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols;	
V.	<b>Transport Layer and Application Layer:</b> UDP, TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos; DNS,SMTP, SNMP,FTP, HTTP, World Wide Web (WWW), Domain Name System (DNS), Telnet, Firewalls; Modern Topics: Wireless LAN: IEEE 802.11;Introduction to Bluetooth, VLAN's, Cellular telephony & Satellite network.	12

## Part C - Learning Resource

### Text Books, Reference Books, E-Resources

#### Text Books:

1. Data Communications and Networking, B. A. Forouzan, TMH, (Latest Edition)
2. Computer Networks, A. S. Tanenbaum, 4<sup>th</sup> Edition, Pearson Education/PHI

#### Reference Books:

1. Computer Networking – A top down approach featuring the internet, Kurose and Rose, Pearson Education.
2. Communication Networks, Walrand, TMH (Latest Edition)
3. Data and Computer Communication, W. Stallings, 5<sup>th</sup> Edition, PHI/Pearson Education

#### E-Resources:

1. NPTEL URL link for Data Communication:  
<https://nptel.ac.in/courses/106105082>
2. Introduction to Data Communication From SWAYAM/NPTEL  
[https://www.youtube.com/watch?v=swtII\\_okidQc&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=1](https://www.youtube.com/watch?v=swtII_okidQc&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=1)
3. Layered Architecture  
<https://www.youtube.com/watch?v=xHO6LjSHeo0&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=2>
4. Data and Signal  
<https://www.youtube.com/watch?v=6ZGVZ7gUccE&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=3>
5. Guided Transmission Media  
<https://www.youtube.com/watch?v=y7v3EAIjWXA&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=5>
6. Unguided Transmission Media  
<https://www.youtube.com/watch?v=hKq1tYIVxdQ&list=PLUfVcb-iqn8dG1-Cn7NTEdILR3hRVgcN&index=6>
7. E-PG Pathshala Link  
<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iLkSuZZ5a+koxhsE1m+YjQ>



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## Part A: Introduction

Program: M.Sc. (C.S.)	Semester: First	Year: I	w.e.f.: 2023-2024
1. Course Code	CST-103		
2. Course Title	Object Oriented Programming with Java		
3. Course Type	Theory		
4. Pre-requisite (if any)	Knowledge of C/C++		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Develop programming skill and learn how to implement new Platform Independent software.</li><li>• Develop new Packages which help them to develop new application software and Utility Software.</li><li>• Develop new Online Software and Internet Games with the help of Applet and AWT Packages.</li><li>• Learn about TCP/IP Client and Server Sockets which helps them to develop Networking Software</li><li>• Familiar about Applet, Thread and Servlet Life Cycle which helps them to develop value added services for Internet Users. Learn about new Integrated Development Environment and new Web servers.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

## Part B: Content of the Course

Unit	Topics	Total Hours
I.	<b>Overview of JAVA:</b> The genesis of java, History of java, Java Virtual Machine (JVM), Java development kit (JDK), Source Files, Jar Files, Compiling and Running of Files, Byte Code, Platform Independency, Data types, Literals, Variables, Constants, Array and it's types, Operators, Conditional and looping statements, various packages, Introduction of class, objects and methods, nested and inner class, string handling, constructor, writing simple JAVA program.	12
II.	<b>Inheritance, Packages and interface-</b> Concept of super and sub class, types of inheritance, access specifiers, Method Overriding, Abstract Class, Constructor in Multilevel Inheritance, using final with Inheritance. <b>Package:</b> Defining package, Rules for creating a new Package, CLASSPATH, Access protection, Importing Package <b>Interface:</b> Defining and Implementing Interface, extending interface, nested interface, importance of interface in Java.	12



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III.	<b>Exception Handling and Multithreading:</b> Using try and catch, multiple catch classes, Nested try statements, throw, throws and finally, Built in Exception, Uncaught Exception, Creating own Exception class. <b>Java Thread Model:</b> Main thread, Creating own Thread, Life cycle of thread, Thread priorities, Synchronization, Interthread Communication, Suspending, Resuming and Stopping thread.	12
IV.	<b>Java Packages: I/O classes:</b> Byte Stream and Character Stream, Predefined Stream, reading console input, writing console output. <b>Applet:</b> Applet Life Cycle, Creating an applet, Using image and sound in applet. <b>Lang:</b> Various classes, Importance class Definition, <b>Util:</b> Framework, Event Model, Scanner Class <b>AWT:</b> Exploring AWT, Event handling – The delegation-event model, Event classes, Source of event, Event listener interfaces, handling mouse and keyboard event, Adapter class <b>Networking:</b> classes and interface, Socket, TCP/IP Client Socket and Server Socket, Inet address, URL Connection.	12
V.	<b>Server site programming and database connectivity:</b> Servlet – Overview of Servlet, Life cycle of servlet, JAVA servlet architecture, Generic servlet and http servlet, The servlet interface, Request and response <b>Integrated Development Environment:</b> Eclipse IDE, Netbeans IDE, MyEclipse IDE <b>Web Servers:</b> Apache Tomcat Web Server, JBoss Server <b>Database Connectivity:</b> JDBC API, Basic Connectivity with Oracle and SQL Server.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. The complete reference, Naughton P and Schildt II., Osborne, McGraw-Hill, Berkeley Publication.
2. Java Programming, By E.Balgurusamy, McGraw-Hill Publication.

### Reference Books:

1. An Introduction to JAVA programming, James R. Levenick, Firewall Media publication.
2. Core JAVA for beginners, Rashmi KantaDas, Vikas Publication.
3. Java beginners Guide, Herbert Schildt, McGraw-Hill Publication.

### E-Resources:

1. SWAYAM URL link for Java : [https://onlinecourses.swayam2.ac.in/aic20\\_sp13/preview](https://onlinecourses.swayam2.ac.in/aic20_sp13/preview)
2. SWAYAM URL link for Java : [https://onlinecourses.nptel.ac.in/noc19\\_cs84/preview](https://onlinecourses.nptel.ac.in/noc19_cs84/preview)
3. SWAYAM URL link for Java : <https://www.dgindia.com/iit-bombay-offers-free-online-course-java-swayam-platform/>
4. SWAYAM URL link for Java : <https://www.classcentral.com/course/swayam-programming-in-java-12930>
5. Coursera URL Link for Java : <https://www.coursera.org/specializations/core-java>
6. Udemmy URL Link for Java: <https://www.udemy.com/course/java-development-for-beginners-learnit/>








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Asst. Prof., Dept. of Computer Science  
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Part A: Introduction				
Program: M.Sc. (C.S.)		Semester: First	Year: I	w.e.f.: 2023-2024
1.	Course Code	CST-104		
2.	Course Title	Operating Systems		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	No		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Describe the importance of computer system resources and the role of operating system in their management policies and algorithms.</li><li>• Understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.</li><li>• Understanding of design issues associated with operating systems.</li><li>• Understand various process management concepts including scheduling, synchronization, and deadlocks.</li><li>• Have a basic knowledge about multithreading.</li><li>• Understand concepts of memory management including virtual memory.</li><li>• Have sound knowledge of various types of operating systems including Unix and Android.</li><li>• Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.</li></ul>		
6.	Credit Value	Theory :4		
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Introduction to Operating System:</b> What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Operating Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control and Real time Systems.	12
II.	<b>Operating System Organization and Process Characterization:</b> Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction, Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Preemptive and Preemptive Scheduling Algorithms.	12



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III.	<b>Inter Process Communication and Synchronization:</b> Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter-process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer problem, Reader-Writer problem. <b>Deadlock:</b> Deadlock, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery.	12
IV.	<b>Memory Management:</b> Physical and Virtual Address Space; Memory Allocation Strategies- Fixed and Variable Partitions, Paging, Segmentation, Virtual Memory: Demand Paging, Page Replacement, Page replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing,	12
V.	<b>Introduction to Android Operating System:</b> Introduction to Android Operating System, Android Development Framework, Android Application Architecture, Android Process Management and File System, Small Application Development using Android Development Framework.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.

### Reference Books:

1. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
2. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
3. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

### E-Resources:

1. **SWAYAM/NPTEL - IITD**  
<https://youtube.com/playlist?list=PLsyIUObW5M3CAGT6OdubyH6FztKfJCcFB>
2. **NPTEL - IIT Madras**  
[https://youtube.com/playlist?list=PL3-wYxht4yCjpcfUDz-TgD\\_ainZ2K3MUZ](https://youtube.com/playlist?list=PL3-wYxht4yCjpcfUDz-TgD_ainZ2K3MUZ)
3. **Coursera:** Introduction: <https://www.coursera.org/specializations/codio-introduction-operating-systems?>
4. **Memory Management:**  
<https://www.coursera.org/learn/codio-intro-to-operating-systems-2-memory-management?specialization=codio-introduction-operating-systems>



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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: First	Year: I	w.e.f.:2023-2024
1. Course Code	CSP101		
2. Course Title	LAB 1: Programming in Java		
3. Course Type	Practical		
4. Pre-requisite (if any)	Theoretical knowledge of C/C++		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Develop application using java based technologies.</li><li>• Demonstrate the principles of object-oriented programming.</li><li>• Understand multi-threading and event handling mechanism.</li><li>• Express different Decision-Making statements and Functions.</li><li>• Understand the concept of JDBC.</li><li>• Develop website using JSP and Servlet.</li></ul>		
6. Credit Value	2		
7. Total Marks	External Marks: 100	Min Passing Marks:36	

Part B: Content of the Course	
Total Hours: 60.	
<b>Tentative Practical List</b>	<p><b>Note:</b> This is tentative list; the teachers concern can add more program as per requirement.</p> <ol style="list-style-type: none"><li>1. Create a java program to implement stack and queue concept.</li><li>2. Write a java package to show dynamic polymorphism and interfaces.</li><li>3. Write a java program to show multithreaded producer and consumer application.</li><li>4. Create a customized exception and also make use of all the 5 exception keywords.</li><li>5. Convert the content of a given file into the uppercase content of the same file.</li><li>6. Develop an analog clock using applet.</li><li>7. Develop a scientific calculator using swings.</li><li>8. Create an editor like MS-word using swings.</li><li>9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.</li><li>10. Create a simple java bean having bound and constrained properties.</li><li>11. Write a java program to create an abstract class named shape that contains two integers and an empty method named print Area () Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class shape. Each one of the class contains only the method</li></ol>



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<p>print Area () that print the area of the given shape.</p> <ol style="list-style-type: none"><li>12. Write a Java program that implements a multithreaded program that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd the third thread will print the value of the cube of the number.</li><li>13. Write a java program which creates a list containing ice cream flavours. On selection of any flavour price should be displayed in a text field.</li><li>14. Write a JDBC program to create a table product (id number, name varchar. Price varchar). And insert a record in the table.</li><li>15. Write a program to execute a select query using JDBC.</li><li>16. Write a program to execute an Update query using JDBC.</li><li>17. Write a server program to return the square root of a number to the client using Socket.</li><li>18. Write a server program to return Date and time to clients using socket programming.</li><li>19. Write a JSP program for basic arithmetic functions.</li><li>20. Write a advance java program to implement registration of student by using JSP.</li><li>21. Write a program to design a web page for login form and connect to the database while using JSP and JDBC.</li></ol>
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## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. The complete reference, Naughton P and Schildt H., Osborne , McGraw-Hill, Berkeley Publication.
2. Java Programming, By E.Balgurusamy, McGraw-Hill Publication.

### Reference Books:

1. An Introduction to JAVA programming, James R. Levenick ,Firewall Media publication.
2. Core JAVA for beginners, Rashmi KantaDas ,Vikas Publication.
3. Java beginners Guide, Herbert Schildt, McGraw-Hill Publication.

### E-Resources:

1. SWAYAM URL link for Java : [https://onlinecourses.swayam2.ac.in/aic20\\_sp13/preview](https://onlinecourses.swayam2.ac.in/aic20_sp13/preview)
2. SWAYAM URL link for Java : [https://onlinecourses.nptel.ac.in/noc19\\_cs84/preview](https://onlinecourses.nptel.ac.in/noc19_cs84/preview)
3. SWAYAM URL link for Java : <https://www.dqindia.com/iit-bombay-offers-free-online-course-java-swayam-platform/>
4. SWAYAM URL link for Java : <https://www.classcentral.com/course/swayam-programming-in-java-12930>
5. Coursera URL Link for Java : <https://www.coursera.org/specializations/core-java>
6. Udemy URL Link for Java: <https://www.udemy.com/course/java-development-for-beginners-learnit/>


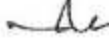


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Part A: Introduction			
Program: M.Sc. (CS)	Semester: First	Year: I	w.e.f.: 2023-2024
1. Course Code	CSP102		
2. Course Title	LAB 1: Operating System (Unix, Linux & Android)		
3. Course Type	Practical		
4. Pre-requisite (if any)	Theoretical knowledge of Java		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Implement various functions of operating system using java program.</li><li>• Implement CPU scheduling algorithms programmatically.</li><li>• Understand kernel and shell.</li><li>• Understanding basic commands to operate Unix/Linux.</li><li>• Explore various flavours of Linux Operating System.</li><li>• Writing shell scripting.</li><li>• Explore android Environment</li><li>• Develop android based application.</li></ul>		
6. Credit Value	2		
7. Total Marks	External Marks: 100	Min Passing Marks:36	

Part B: Content of the Course	
Total Hours: 60	
<b>Tentative Practical List</b>	<p><b>Note:</b> This is tentative list; the teachers concern can add more program as per requirement.</p> <ol style="list-style-type: none"><li><b>1. Process Management:</b><ul style="list-style-type: none"><li>• Create a java program to demonstrate the creation of a new process using fork() system call.</li><li>• Implement a program to show the usage of exec() family system calls to execute different programs.</li><li>• Write a java program to simulate the producer-consumer problem using multithreading and synchronization mechanisms like semaphores.</li></ul></li><li><b>2. Memory Management:</b><ul style="list-style-type: none"><li>• Create a java program to implement a simple dynamic memory allocator using explicit free list approach.</li><li>• Write a program to demonstrate the concept of virtual memory by implementing a simple demand-paging system.</li></ul></li><li><b>3. Scheduling Algorithms:</b><ul style="list-style-type: none"><li>• Write a java program to implement the First-Come-First-Serve (FCFS) scheduling algorithm for a set of processes.</li><li>• Create a program to simulate the Round Robin (RR) scheduling algorithm</li></ul></li></ol>



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	<p>with a given time quantum.</p> <p><b>4. Unix Operating System:</b> Getting familiar with the Unix environment, Logging in and logging out, Understanding the Unix file system structure, Navigating directories (ls, cd, pwd) Creating, copying, moving, and deleting files and directories (mkdir, cp, mv, rm) Viewing and editing files (cat, less, head, tail, vi), Redirecting input and output (&gt;, &gt;&gt;, &lt;) Combining and splitting files (cat, split), Archiving files (tar, gzip, zip).</p> <p><b>5. Understanding file permissions (chmod, chown, chgrp) Managing processes (ps, top, kill, jobs) Running processes in the background (bg, fg, Ctrl + Z, Ctrl + C) Using basic process control commands (nice, renice).</b></p> <p><b>6. Introduction to shell scripting</b> Creating and running shell scripts, Using variables and basic data types Conditional statements (if, else, elif), Looping constructs (for, while).</p> <p><b>7. Introduction to Android OS and its architecture</b> Setting up the development environment (Android Studio, SDK, AVD Manager) Creating a new Android project, Understanding the project structure and resources.</p> <p><b>8. User Interface Design</b> Working with XML layout files (RelativeLayout, LinearLayout, ConstraintLayout, etc.) Adding UI elements (TextView, EditText, Button, ImageView, etc.) Handling user input and events (OnClickListener, OnLongClickListener, etc.).</p>
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Part C - Learning Resource	
Text Books, Reference Books, E-Resources	
<b>Text Books:</b>	
1. UNIX and Linux System Administration Handbook" by Evi Nemeth, Garth Snyder, Trent R. Hein, and Ben Whaley.	
2. Android Programming: The Big Nerd Ranch Guide by Bill Phillips, Chris Stewart, and Kristin Marsicano:	
<b>Reference Books:</b>	
1. UNIX: The Textbook by Syed Mansoor Sarwar, Robert Koretsky, and Syed Aqeel Sarwar:	
2. UNIX in a Nutshell by Arnold Robbins and Nelson H. F. Beebe:	
3. Head First Android Development by Dawn Griffiths and David Griffiths:	
4. Android Studio 4.0 Development Essentials by Neil Smyth:	
<b>E-Resources:</b>	
1. <b>Linux Fundamentals</b>	



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[https://onlinecourses.swayam2.ac.in/aic20\\_sp24/preview](https://onlinecourses.swayam2.ac.in/aic20_sp24/preview)

2. Unix System Basics

<https://www.coursera.org/learn/codio-unix-system-basics>

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Part A: Introduction			
Program: M.Sc. (CS)	Semester: Second	Year: I	w.e.f.: 2023-2024
1. Course Code	CST201		
2. Course Title	Relational Database Management System		
3. Course Type	Theory		
4. Pre-requisite (if any)	No		
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 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 help them to generate new relationships among various Tables and Databases which are useful for Software Development.</li><li>• Make familiar about 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.</li><li>• Development which enhances their Data Storage, Data Accessibility and Data Management.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks : 36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Overview of Database Management:</b> Data, Information and Knowledge, Data Processing versus Data Management, File Oriented Approach versus Database Oriented Approach, Data Independence, Database Administration Roles, Overview of Database, DBMS Architecture, Different kinds of DBMS users, Introduction to Data Dictionary, Data Models: Network Model, Relational Model, Hierarchical Model. Database Languages: DDL, DML, DCL, And TCL. Structured Query Language: Basic Data Types, Commands: Create, Insert, Select, Delete, Truncate, Drop, Alter, Grant ,Revoke, Commit, Rollback, Queries on Multiple Relation, Join Operations, String Operations, Set Operations, Grouping, Nested Sub queries.	12
II.	<b>Concepts of Database Management System:</b> Definition of Tables, Cardinality relationships in a Database, Constraints in a Database, Entity, Attributes, Strong and weak entities, ER-Diagram, Symbols and Implementation. Concept of keys: Candidate key, Primary key, Alternate key, Foreign key, Case studies of ER modeling Generalization, Specialization and Aggregation. Converting an ER model into relational Schema.	12



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III.	<b>Relational Database Design:</b> Normalization concept in logical model, Pitfalls in database design, Functional dependencies, Join dependencies, Natural Join, Normal forms (1NF, 2NF, 3NF). Boyce-Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. De-normalization. Relational Database, Structure of Relational Database, Schema, Relational Operation : Selection, Projection, Cartesian Production, Union, Intersection and Minus operation. 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).	12
IV.	<b>Transaction Processing</b> ACID Properties of Transactions, Concurrency control, Transaction support in SQL, Locking Techniques. Database recovery techniques - Shadow paging, Log Based Recovery, ARIES recovery algorithm, Database Security, Deadlock: Detection, Avoidance and Recovery.	12
V.	<b>DBMS Software's:</b> Oracle, SQL Server and MySQL- Oracle, SQL Server and MySQL Installation, Features of this software's, Database creation, Backup and restore. <b>Implementation of SQL:</b> Data Definition Language (DDL) Commands, Data Manipulation Language (DML) Commands, Data Control Language (DCL) Commands, Transaction Control Language (TCL) Commands, Data Constraints, Introduction to PL/SQL Programming, Data Types, Looping Statements, Cursors, Stored Procedure, Function ..	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Suggested Readings:

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

### Reference Books:

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

### E Resources:

1. SWAYAM URL link for DBMS and RDBMS: <https://youtu.be/f6LGtJutWvA>
2. SWAYAM URL link for DBMS and RDBM: <https://youtu.be/loL9Ve2SRwO>
3. SWAYAM URL link for DBMS and RDBMS: <https://swayam.gov.in/courses/4434-data-base-management-system>.
4. Introduction of DBMS: [https://onlinecourses.swayam2.ac.in/cec19\\_cs05/preview](https://onlinecourses.swayam2.ac.in/cec19_cs05/preview)
5. Introduction of RDBMS: [https://onlinecourses.nptel.ac.in/noc19\\_cs46/preview](https://onlinecourses.nptel.ac.in/noc19_cs46/preview)
6. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ>
7. <https://www.coursera.org/learn/introduction-to-relational-databases>

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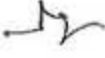
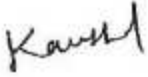




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Part A: Introduction			
Program: M.Sc. (CS)		Semester: Second	Year: I
w.e.f.: 2023-2024			
1.	Course Code	CST202	
2.	Course Title	Data Structure	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	No	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Use different types of data structures, operations and algorithms.</li><li>• Implement appropriate sorting/searching technique for any given problem.</li><li>• Use stack, Queue, Lists, Trees and Graphs in problem solving.</li><li>• Find suitable data structure during application development/ Problem Solving.</li><li>• Understand complex data structure like B+ Tree, Graph and use this structure in problem solving.</li></ul>	
6.	Credit Value	Theory: 4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks : 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Introduction and Basic Concepts of Data Structure:</b> Data types: primitive, non-primitive data types, ADT, Linear and nonlinear data structure. <b>Linear Data Structures:</b> Arrays: One dimensional, Multidimensional array, allocation methods, address calculations, sparse arrays. Linked List: Singly and Doubly Linear link lists, singly and doubly circular linked list: Definitions, operations (INSERT, DELETE, TRAVERSE) on these lists. (Insertion operation includes – insertion before a given element, insertion after a given element, insertion at given position, insertion in sorted linked list).	12
II.	<b>Stack:</b> Definition, Operations: PUSH, POP, TRAVERSE, implementations using array and linked list, Applications of stack: Infix, Prefix, Postfix representation and conversion using stack, Postfix expression evaluation using stack. <b>Queue:</b> Introduction, and Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations (INSERT, DELETE, TRAVERSE), implementation using array and linked list and applications.	12



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III.	<b>Non-linear Data Structure:</b> <b>Trees:</b> Definition of trees and their types, Binary trees, Properties of Binary trees and Implementation, operations (Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal), Binary Search Trees, Implementations, Threaded trees, AVL Trees.	12
IV.	<b>Graph:</b> Definition of Graph and their types, adjacency and incident matrices and 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. Static Hashing: Introduction, Hash table, Hash function.	12
V.	<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, Hashing, collision Resolution methods, Comparison of Search trees.	12

## Part C - Learning Resource

### Text Books, Reference Books, E-Resources

#### Text Book:

1. Fundamentals of Data Structures, Horowitz and Sahani, Computer Science Press, 1978
2. Data structure Through C, G. S. Baluja, Dhanpat Rai And Co.
3. Data Structure, Seymour Lipschutz, Schaum's Outline Series

#### Reference Books:

1. Data Structures and Algorithms in C++, Michael T. Goodrich, Wiley, 2007
2. Data structures and Algorithms, Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman.
3. An Introduction to Data Structures with Applications, Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985
4. Data Structures and Program Design in C, R. Kurse, Leung & Tondo, 2<sup>nd</sup> Edition, PHI publication

#### E Resources:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckOKJvP3a/8Vd3L08tQ==>
2. <https://www.coursera.org/learn/data-structures>
3. SWAYAM Link [https://onlinecourses.swayam2.ac.in/cec19\\_cs04/preview](https://onlinecourses.swayam2.ac.in/cec19_cs04/preview)
4. SWAYAM course on Programming, Data Structures And Algorithms Using Python-  
[https://onlinecourses.nptel.ac.in/noc23\\_cs95/preview](https://onlinecourses.nptel.ac.in/noc23_cs95/preview)
5. SWAYAM course on Data Structures  
[https://onlinecourses.swayam2.ac.in/cec22\\_cs10/preview](https://onlinecourses.swayam2.ac.in/cec22_cs10/preview)
6. SWAYAM course on Data Structures  
[https://onlinecourses.swayam2.ac.in/cec23\\_cs09/preview](https://onlinecourses.swayam2.ac.in/cec23_cs09/preview)


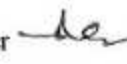





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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: Second	Year: I	w.e.f.: 2023-2024
1. Course Code	CST203		
2. Course Title	Software Engineering		
3. Course Type	Theory		
4. Pre-requisite (if any)	Basic Knowledge of programming methodology and database management system		
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 Basic knowledge of analysis and design of complex systems.</li><li>• Apply software engineering principles and techniques.</li><li>• Produce efficient, reliable, robust and cost-effective software solutions.</li><li>• Work as an effective member or leader of software engineering teams.</li><li>• Manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Introduction to Software Engineering:</b> Evolving Role of Software; Software Characteristics; Software Applications. Software Design Processes: Introduction; What is Meant by Software Engineering? , Definitions of Software Engineering; Terminologies: Product and Process, People, Project, Module and Software Components .Software Life Cycle Models: Waterfall Model, Incremental Process Model, Evolutionary Process Model, Unified Process Model.	12
II.	<b>Software Requirement:</b> Requirement Engineering, Types of Requirements: Functional and non-functional, User and System, Feasibility studies, Requirement Elicitation: Interviews, Brainstorming, Facilitated Application Specification Technique, Quality function deployment, Use case approach, Requirement Analysis: Data Flow Diagram, Data Dictionary, E-R Diagrams, Software Prototyping, Requirement Documentation: SRS, Characteristics of SRS, Requirement Validation and Management.	12



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III.	<b>Software Project Planning:</b> Size Estimation: LOC, Function Count, Cost Estimation, The constructive Cost Model (COCOMO), COCOMO-II, Software risk management. <b>Software Design:</b> What is Design? Module coupling and Module cohesion, Strategy of Design: Bottom-up, Top-down Design, Hybrid Design, and Function oriented design. Object oriented design: Basic Concepts, Steps to analyze and design object oriented System.	12
IV.	<b>Software Metrics:</b> Definition, Area of application, Categories of Metrics, Token Count, Object Oriented Metrics. <b>Software Reliability:</b> Introduction, Software and Hardware Reliability, Software Quality, Software Reliability Models, Capability Maturity Model: Maturity levels, Key process areas, common features.	12
V.	<b>Software Testing:</b> What is Testing? Terminologies: Error, Mistake, Bug, Fault and Failure, Verification and Validation, Functional Testing: Boundary value analysis, Equivalence Class Testing, Decision Table Based Testing, Structural Testing: Path Testing, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Levels of Testing: Unit Testing, Integration Testing, System Testing, Validation Testing, Black box and White box testing. Art of Debugging: Techniques, Approaches and Tools. Software Maintenance.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. R. G. Pressman – Software Engineering, TMH
2. Sommerville, Ian, Software Engineering, Pearson Education
3. Pankaj Jalote – An Integrated Approach to Software Engineering, Narosa Publications.

### Reference Books:

1. P fleeger, Shari Lawrence, Software Engineering Theory and Practice, second edition. Prentice- Hall 2001.
2. Object Oriented & Classical Software Engineering (Fifth Edition), SCHACH, TMH
3. Software Engineering: K.K. Agrawal and Yogesh Singh, New age international publishers.

### E Resources:

1. Introduction to Software Engineering from NPTEL:  
<https://nptel.ac.in/courses/106101061>
2. Software Engineering from Coursera  
<https://www.coursera.org/specializations/software-engineering>
3. Software Development Life Cycle from Coursera:  
<https://www.coursera.org/specializations/software-development-lifecycle>
4. Software Design Architecture from Coursera:  
<https://www.coursera.org/specializations/software-design-architecture>
5. Software Engineering from SWAYAM/NPTEL  
[https://onlinecourses.nptel.ac.in/noc19\\_cs69/preview](https://onlinecourses.nptel.ac.in/noc19_cs69/preview)

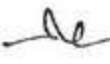


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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: First	Year: I	w.e.f.: 2023-2024
1. Course Code	CST-204		
2. Course Title	Elective-I: Computer Graphics		
3. Course Type	Theory		
4. Pre-requisite (if any)	No		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.</li><li>• Learn the basic principles of 3-dimensional computer graphics.</li><li>• Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the Picture definition.</li><li>• Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.</li><li>• Understand principles of various data compression techniques.</li><li>• Investigate the role of computer graphics in multimedia applications.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Fundamentals of Computer Graphics:</b> Concepts and applications, Random and Raster scan devices, input-output devices: CRT, LCD, laser printer. <b>Output primitives:</b> Line drawing algorithm: DDA and Bresenham's; Circle generating algorithm: Bresenham's Midpoint algorithms, Area filling: boundary fill algorithm, flood fill algorithm: Scan-line Polygon Fill Algorithm. Antialiasing techniques: super sampling, pixel weighting, area sampling, pixel phasing.	12
II.	Transformation, viewing, Clipping: 2-D Transformation: Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinate composite transformations. Two dimensional viewing: Viewing pipeline Window-to-viewport transformation. Clipping operations: Line Clipping: Cohen Sutherland and Liang barsky, Polygon Clipping: Cohen Sutherland.	12
III	3D Transformation, Visible Surface Detection and curves: Visible Surface detection Algorithm: Object based and image based	12

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III.	methods, depth comparison. 3-D Transformation: translation, scaling, rotation, reflection. Three-dimensional object representations 3-D Viewing Projections –parallel and perspective projection. Curved lines and Surfaces: Spline representations, Interpolating and approximation curves, Continuity conditions, Bezier curves: concept and characteristics; B-Spline curves: concept and characteristics.	
IV.	Color Models and Basic Concept of Animation: Introduction of multimedia: Properties and applications, types of medium, data stream characteristics, Basic File and Data format: BMP, JPEG, GIF, TIFF. Color models: RGB, YIQ, CMY, HSV. Animation: Basic concept, animation languages, computer-based animation, methods of controlling animation, display of animation, animation techniques: onion skinning, motion cycling, masking, morphing, and transmission of animation, Multimedia Authoring tools.	12
V.	Multimedia Systems: Data compression: storage space, coding requirements. Source, entropy and hybrid coding some basic compression technique: run length code, Huffman code. JPEG: Image preparation, Lossy sequential DCT –based mode, expanded Lossy DCT based mode, Lossless mode and hierarchical mode. MPEG, Huffman Encoding, LWZ compression.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Books:

1. Computer Graphics, by Donald Hearn (Author), M. Pauline Baker (Author)
2. Foundation of 3D computer Graphics, Steven J Gortler

### Reference Books:

1. Procedural Elements for Computer Graphics, D.F. Rogers, Tata McGraw Hill
2. Fundamentals of Interactive Computer Graphics, J.D. Foley and A.D. Van, Addison- Wesley.
3. Principles of Interactive Computer Graphics, Newman, Tata McGraw Hill.
4. Theory & Problem of Computer Graphics, Plastock, Schaum Series.

### E-Resources:

1. e-PG Pathshala Link  
<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ=>
2. SWAYAM Link [https://onlinecourses.nptel.ac.in/noc22\\_cs111/preview](https://onlinecourses.nptel.ac.in/noc22_cs111/preview)
3. Coursera Link <https://www.coursera.org/learn/interactive-computer-graphics>
4. Unacademy link <https://unacademy.com/course/complete-course-on-computer-graphics/M989N1KN>








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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: Second	Year: I	w.e.f.: 2023-2024
1. Course Code	CST205		
2. Course Title	Elective-I: Introduction to Block chain Technology		
3. Course Type	Theory		
4. Pre-requisite (if any)	A sound knowledge of data structure and programming		
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 block chain technology.</li><li>• Understand Crypto currency.</li><li>• Understand Smart contract.</li><li>• Develop block chain based solutions and write smart contract using Ethereum Framework.</li><li>• Deploy Decentralized Application.</li></ul>		
6. Credit Value	Theory: 4		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Introduction:</b> Overview of Block-chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet, Digital Currency, Ledgers, Types of Block chain Platforms. Characteristics, Limitations and applications of Blockchain technology.	12
II.	<b>Consensus Mechanism:</b> Permissioned Blockchain, Permission less Blockchain, Different Consensus Mechanism- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance.	12
III.	<b>Crypto currency and Wallet:</b> Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, MetaMask, Creating an account in MetaMask, Use of faucet to fund wallet, transfer of cryptocurrency in MetaMask. <b>Smart contract and Ethereum;</b> Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE, Different networks of ethereum, understanding blocks, how to compile and deploy smart contract in remix.	12
IV.	<b>Understanding Hyperledger Fabric:</b> Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities	12



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	and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.	
V.	<b>Use Cases:</b> Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain, Blockchain in energy sector, Blockchain in governance.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### TEXT BOOKS:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin. and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies.

### REFERENCE BOOKS

1. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.
2. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," Yellow paper.2014.
3. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts.
4. Melanie Swan, Blockchain: Blueprint for a New Economy.
5. Imran Bashier, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks.
6. Andrews, Mastering Ethereum: Building Smart Contracts and DApps.

### E-RESOURCES:

1. Swayam/NPTEL: [https://onlinecourses.swayam2.ac.in/aic21\\_ge01/preview](https://onlinecourses.swayam2.ac.in/aic21_ge01/preview)
2. Swayam/NPTEL: [https://onlinecourses.nptel.ac.in/noc20\\_cs01/preview](https://onlinecourses.nptel.ac.in/noc20_cs01/preview)
3. edX: <https://www.edx.org/course/blockchain-technology>
4. Coursera: <https://www.coursera.org/search?query=Blockchain&>
5. Hyperledger Fabric: <https://www.youtube.com/watch?v=GWoN9TwbM20>
6. Case studies of Blockchain: <https://www.youtube.com/watch?v=GTExtJlE7I>
7. <https://www.youtube.com/watch?v=fhWjGs-2PLE&list=PLkkt2qQlhbKYLQ1fFKXHmw64QfC9bRz2G>








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Part A: Introduction				
Program: M.Sc. (C.S.)		Semester: Second	Year: I	w.e.f.: 2023-2024
1.	Course Code	CST206		
2.	Course Title	Elective-I: Cryptography and Network Security		
3.	Course Type	Theory		
4.	Pre-requisite (if any)	Basic knowledge of networking and algorithms		
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"><li>• Classify the symmetric encryption techniques.</li><li>• Illustrate various Public key cryptographic techniques.</li><li>• Evaluate the authentication and hash algorithms.</li><li>• Summarize the intrusion detection and its solutions to overcome the attacks.</li><li>• Understand basic concepts of system level security.</li></ul>		
6.	Credit Value	Theory: 4		
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	<b>Classical Encryption Technique:</b> Basics of computer network, TCP/IP model, Foundations of Cryptography and security trends, Secret key vs public key cryptography, Symmetric cipher model, substitution techniques, Transportation techniques, Mathematical tools for cryptography: modular arithmetic, Euclidean algorithm, finite fields, polynomial arithmetic.	12
II.	<b>Symmetric Cipher:</b> Symmetric cipher model, Traditional block cipher: Stream and block cipher, Feistel cipher network structure, Design Principles of Block Ciphers, Data Encryption Standard (DES), Strength of DES, Triple DES, Block cipher design principle, Block cipher operation, Advance encryption Standard (AES), Evaluation criteria of AES, AES transformation function, key distribution.	12
III.	<b>Public Key cryptography and Hash Function:</b> Principles of public key cryptosystem, Requirement, RSA algorithm. Hash function, Key management: Diffie-Helman Key exchange, Man in the middle attack, elliptic curve arithmetic, elliptic curve cryptography, Application of cryptographic hash function, Hash and	12



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	Message authentication Code (MAC), Hash and MAC algorithms, MAC based on hash function, Digital signature and Authentication protocol. Key management and distribution: Distribution of symmetric key and public key, Public key Infrastructure (PKI).	
IV.	<b>IP and Web security protocols:</b> User authentication: principle, Remote user authentication using symmetric and asymmetric encryption, Kerberos, E-mail security: Pretty Good Privacy (PGP), S/MIME, IP security: IPsec, transport layer Security: Secure Socket layer (SSL), Secure Electronic Transaction (SET).	12
V.	<b>Network Security and Management:</b> Principles of cryptography, Authentication, integrity, key distribution and certification, Access control and Firewalls, attacks and counter measures, security in many layers. Infrastructure for network management, The internet standard management framework, SMI, MIB, SNMP, Security and administration.	12

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### TEXT BOOKS:

1. Cryptography and Network Security, William Stallings, 4th Edition Pearson Publication.
2. Network security and cryptography, Bernard Menezes, Cenage Learning India Pvt. Ltd. First edition 2010.

### REFERENCE BOOKS

1. Applied cryptography - protocols and algorithm, Bruce Schneier, Springer Verlag 2003.
2. Cryptography and Network Security, Atul Kahate, TMH Publication.
3. Cryptography and Network Security, Behrouz A. Forouzan, First Edition, TMH Publication.
4. Network Security: Private Communication in Public World By Charlie Kaufman, Radia Perlman and Mike Speciner, PHI Publication.

### E-RESOURCES:

1. Swayam/NPTEL: [https://onlinecourses.nptel.ac.in/noc20\\_cs21/preview](https://onlinecourses.nptel.ac.in/noc20_cs21/preview)
2. Swayam/NPTEL: [https://onlinecourses.nptel.ac.in/noc20\\_cs02/preview](https://onlinecourses.nptel.ac.in/noc20_cs02/preview)
3. Coursera: <https://www.coursera.org/search?query=Cryptography>
4. Coursera: <https://www.coursera.org/search?query=network%20security&>
5. [https://www.vssut.ac.in/lecture\\_notes/lecture1428550736.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf)
6. <http://www.anuraghyd.ac.in/cse/vp-content/uploads/sites/10/NS-CRYPTO-LAB-Final11.pdf>
7. <https://www.vvitengineering.com/lab/odd/CS6711-Security-Lab-Manual.pdf>
8. <https://www.vidyarthiplus.com/vp/attachment.php?aid=53300>  
<https://kgr.ac.in/storage/2021/08/CNS-LAB-Manual.pdf>








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Part A: Introduction			
Program: M.Sc. (C.S.)	Semester: Second	Year: I	w.e.f.:2023-2024
1. Course Code	CSP201		
2. Course Title	LAB 3: Relational Database Management System		
3. Course Type	Practical		
4. Pre-requisite (if any)	Basic Knowledge of SQL		
5. Course Learning Outcomes (CLO)	At the end of this course, Students will be able to: <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 help them to generate new relationships among various Tables and Databases which are useful for Software Development.</li><li>• Become familiar about 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 Projects.</li></ul>		
6. Credit Value	2		
7. Total Marks	External Marks: 100	Min Passing Marks:36	

Part B: Content of the Course	
Total Hours: 60	
Tentative Practical List	<p>Note: This is tentative list; the teachers concern can add more program as per requirement.</p> <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 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 above created table.</li><li>b) Display all five records.</li><li>c) Use foreign key relation and display records.</li><li>d) Update the second record of field deptid as 'Sales'.</li></ol></li></ol>



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- e) Add one new field in the table.
3. Create a new user in Oracle/SQL Server.
4. Create a view in Oracle/SQL Server.
5. Create a new table in Oracle/SQL Server and practice for join operation.
6. Create a new user in Oracle/SQL Server and practice for commit and rollback command.
7. Create a new database in Oracle/SQL Server having at least five tables for Hotel Management System.
8. Create a new database in Oracle/SQL Server having at least four tables for Covid Vaccination Management System.
9. Create a new database in Oracle/SQL Server having at least five tables for Library Management System.
10. Create a new table in Oracle/SQL Server and practice for Group by and Order by Clause.
11. Create a new table in Oracle/SQL Server and practice for max(), min(), avg() and count() functions.
12. Create a new table in Oracle/SQL Server and practice for lower(), substr(), trim() and upper() functions.
13. Create a new table in Oracle/SQL Server and practice for unique and check constraint.
14. Create a new table in Oracle/SQL Server and practice for any two date formats.
15. Create a new table in Oracle/SQL Server and practice for using clause.
16. Create a new table in Oracle/SQL Server and practice for having clause with sub queries.
17. Create a new table in Oracle/SQL Server and practice for alias in any table.
18. Create a new table in Oracle/SQL Server and practice for inner and outer join.
19. Create a new table in Oracle/SQL Server and practice for Drop command.
20. Write a PL/SQL program for addition of two numbers.
21. Write a PL/SQL program to find the factorial value of any entered number.
22. Write a PL/SQL program for swapping of two numbers.
23. Write a PL/SQL program to print first ten Natural Numbers.
24. Write a PL/SQL program to generate even series upto five digits starting from 2 and sum all the terms.
25. Write a PL/SQL program to practice for implicit and explicit cursor.



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## Part C - Learning Resource

### Text Books, Reference Books, E-Resources

#### Text Books:

1. Database system concept , H. Korth and A. Silberschatz, TMH Publications .
2. Data Base Management System, Alexies&Mathews,Vikash publication.

#### Reference Books:

1. Data Base Management System, C. J. Date ,Narosha Publication.
2. Data Base Management System by James Matin.
3. Principles of Database System by Ullman.
4. Program Design, Peter Juliff, PHI Publications.
5. The Complete Reference, Kevin Loney, Oracle Press.
6. SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross ,PustakKosh Publication.
7. Microsoft SQL Server Management and Administration, Ross, STM Publications.

#### E Resources:

1. SWAYAM URL link for DBMS and RDBMS: <https://youtu.be/f6I.GtJutWyA>
2. SWAYAM URL link for DBMS and RDBM: <https://youtu.be/IoL9Ve2SRwQ>
3. SWAYAM URL link for DBMS and RDBMS : <https://swayam.gov.in/courses/4434-data-base-management-system>








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Part A: Introduction				
Program: M.Sc. (CS)		Semester: Second	Year: I	w.e.f.: 2023-2024
3.	Course Code	CSP202		
4.	Course Title	LAB 4: Data Structure		
5.	Course Type	Practical		
6.	Pre-requisite (if any)	-		
7.	Course Learning Outcomes (CLO)	At the end of this course Student will be able to : <ul style="list-style-type: none"><li>• Proficient in implementing data structures using different programming languages.</li><li>• Understand and implementation of fundamental data structures like arrays, linked lists, stacks, queues, trees, heaps, graphs, and hash tables.</li><li>• Analyze the time and space complexity of algorithms used in data structures.</li><li>• Enhance problem-solving skills by using data structures to solve a variety of programming challenges.</li><li>• Understand the concept of recursion and its application in problem-solving.</li><li>• Become familiar with various sorting and searching algorithms and should be able to implement them.</li><li>• Develop critical thinking skills by evaluating different data structures and algorithms for specific use cases.</li></ul>		
8.	Credit Value	2		
9.	Total Marks	External Marks: 100	Min Passing Marks:36	

Part B: Content of the Course	
Total Hours: 60	
<b>Tentative Practical List</b>	<b>Note:</b> This is tentative list; the teachers concern can add more program as per requirement. <b>Implementing basic data structures using any Programming language of your choice:</b> <ol style="list-style-type: none"><li>1. <b>Arrays:</b> Implementation of One Dimensional and Two Dimensional Array Creation, Insertion, Deletion, Traversal, Searching, Sorting Operation using any programming language.</li><li>2. <b>Linked List:</b> Implementing singly linked lists and doubly linked lists, Operations: insertion, Deletion, Traversal Operation using any programming language.</li><li>3. <b>Stack:</b> Implementation of Push and Pop operation, Polish notation implementation. Implementing stacks and queues using arrays and linked lists. Solving problems using stacks and queues (e.g.: expression evaluation, breadth-first search).</li></ol>



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4. **Recursion and Backtracking:** Understanding recursion and its applications in data structures. Solving problems using recursive algorithms and backtracking techniques.
5. **Trees:** Implementing binary trees and binary search trees. Traversing binary trees (pre-order, in-order, post-order) Binary search tree operations: insertion, deletion, and searching.
6. **Heaps and Priority Queues:** Implementing binary heaps and their operations (searching, insert, delete) Understanding priority queues and their applications.
7. **Hashing:** Implementing hash tables and hash functions, Resolving collisions (c.g., chaining, open addressing)
8. **Graphs:** Implementing graphs using adjacency matrix and adjacency list representations. Graph traversal algorithms (depth-first search, breadth-first search).
9. **Sorting Algorithms:** Implementing common sorting algorithms (bubble sort, selection sort, insertion sort) Understanding quicksort and merge sort.
10. **Searching Algorithms:** Implementing linear search and binary search. Understanding tree-based search algorithms (e.g., binary search trees).

## Part C - Learning Resource

Text Books, Reference Books, E-Resources

### Text Book:

1. Fundamentals of Data Structures, Horowitz and Sahani, Computer Science Press, 1978
2. Data structure Through C, G. S. Baluja, Dhanpat Rai And Co.

### Reference Books:

1. Data Structures and Algorithms in C++, Michael T. Goodrich, Wiley, 2007
2. Data structures and Algorithms, Aefred V. Aho, Jhon E. Jopcroft and J.E. Ullman.
3. An Introduction to Data Structures with Applications, Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985
4. Data Structures and Program Design in C, R. Kurse, Leung & Tondo, 2<sup>nd</sup> Edition, PHI publication

### E-Resources:

Data Structure related topics from SWAYAM/NPTEL

1. Introduction to Data Structure  
<https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F&index=1>
2. Stacks  
<https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLBF3763AF2E1C572F&index=2>
3. Queues and linked list  
<https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3>
4. Trees  
<https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6>
5. Graphs  
<https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=5>





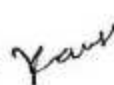




# अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

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