Shri Rawatpura Sarkar University, Raipur

Teaching & Examination

Scheme & Syllabus

For

M. Sc. (CS)

Semester-I

(Effective from the session: 2022-23)

Department of Computer Science & Engineering

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

Sr. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	**T**	**P**		Continuous Evaluation	Sem End Exam	Total	
1	SMS04101	Mathematical Foundation of Computer Science	3	1	-	4	30	70	100	3 Hr.
2	SMS04102	Operating Systems	3	1	-	4	30	70	100	3 Hr.
3	SMS04103	C++ and Data Structure	3	1	-	4	30	70	100	3 Hr.
4	SMS04104	Programming with Java	3	1	-	4	30	70	100	3 Hr.
5	SMS04105	Computer Graphics	3	1	-	4	30	70	100	3 Hr.
6	SMS04191	Programming with Java Lab	-	-	4	2	15	35	50	3 Hr.
7	SMS04192	Computer Graphics Lab	-	-	4	2	15	35	50	3 Hr.
Total Contact hr. per week: 28			**Total Credit**			**24**	**180**	**420**	**600**	

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	**Mathematical Foundation of Computer Science**				
Course Code	SMS04101				
Semester	**M.Sc. CS – 1st**				
Course Credit	**L**	**T**	**P**		
	3	**1**	**-**		
Prerequisites	Basic knowledge of mathematics.				
Course Objectives	1. To make student learn the logical structure of statement, Boolean algebra and its valid applications. 2. To make students learn concepts of relations and functions. 3. To make students learn Cartesian product of sets and grammars 4. To make students understand the concepts of graphs and their matrix representation. 5. To make students learn the basic concepts of Graph theory and its application in coding.				
Course Contents	**UNIT–I Mathematical Logic & Boolean Algebra:** Statements & Notations, Connectives, Normal Forms, Basic concepts of Boolean Algebra, Boolean functions, Applications of Boolean Algebra in Switching Circuits, Logic circuits, Karnaugh maps, methods for simplification of Boolean expressions.. **UNIT–II Ordered Structures, Relations & Functions:** Tuples, Lists, Strings & Languages, Numerals Relations, Properties of Relations, Partial order Relation, Lattices. Functions, Properties of Functions, Composition of Functions, The map function & some useful functions. **UNIT-III Construction Techniques & Grammars:** Inductively defined sets, Numbers, Strings, Lists, Binary Trees, Cartesian product of sets, Recursive functions and Procedures, Grammars.				

	UNIT-IV Graph Theory: Basic Concepts of graph theory, Path & Circuits, Trees & Fundamentals, Circuits, Matrix representation of graphs, Directed Graphs. **UNIT-V** Group Theory & Coding: Basic Concepts of Group Theory, Homomorphism & Isomorphism of Groups, Cosets & Langrage's Theorem ,Elements of Coding Theory, Group codes, Decoding, Hamming Matrices, Parity check & Generator Matrices
Course Outcomes	1. Students will be able to analyze the logical structure of statements symbolically including the proper use of logical connectives, applications of Boolean algebra in circuits and karnaugh map. 2. Students will be able to determine whether a relation is reflective, symmetric and transitive. They will be able to apply the different types of functions and Hash diagram. 3. Students will be able to construct inductively defined sets and recursive function.
Text Books	1. Discrete Structure, and Logic and Computability, James L. Hein, Narosa Pub. House. 3rd Edition. 2. Discrete Mathematical Structures with Applications to Computer Science, Trem blay, J.P. & M anohar .R., Tata M cG raw Hill. 2000.
Reference Books	1. Discrete and Combinatorial Mathematics, Ralph, Grimaldi, Pearson Education.5th edition. 2. Graph Theory with Applications to Engineering & Computer Science, N. Deo,Prentice Hall. 2004. 3. Discrete Mathematical Structures, Kolman, B, Busby, R.C.Ross, S.C. Pearson Education. 2006. 4. Elements of Discrete Mathematics, Liu, C.L. 2006Tata McG raw Hill, 2nd edition.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	**Operating System**				
Course Code	**SMS04102**				
Semester	**M.Sc. CS- 1st Sem**				
Course Credit	**L**	**T**	**P**	**T C**	
	3	**1**	**-**	**4**	
Prerequisites	A course on "Computer Programming and Data Structures". A course on "Computer Organization and Architecture".				
Course Objectives	1. Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection). 2. Introduce the issues to be considered in the design and development of operating system. 3. Introduce basic Unix commands, system call interface for process management, interprceses communication and I/O in Unix				
Course Contents	**UNIT – I** **Introduction:** Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation. **UNIT – II** **Process Management:** Concepts of process: Process status, Process description, Process model. Process Scheduling: Concepts, Scheduler organization, preemptive and non preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS. **UNIT – III** **Process Synchronization and Deadlock:** Process Co-operation, Concepts of Interprocess communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores.				

	Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance. **UNIT – IV** **Memory Management and File system:** Paging, Segmentation and Contiguous memory allocation. Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management. **UNIT – V** **Disk management and other issues:** Disk management: Disk Structure and Scheduling. File systems, and operating system support for distributed systems. Protection and Security related issues. Case studies of contemporary operating systems.
Course Outcomes	1. Will be able to control access to a computer and the files that may be shared. 2. Demonstrate the knowledge of the components of computer and their respective roles in computing. 3. Ability to recognize and resolve user problems with standard operating environments. 4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively
Text Books	1. Operating System concepts by Silberscatz A and Peterson, J.L, PE- LPE. 2. Operating System Design & Implementation by Tanenbaum, A.S., PHI. 3. Operating system concepts Galvin by Silberscatz, John Weiley& Sons
Reference Books	1. Operating System in Depth Design and Programming by Thomas Doeppner, Wiley India. 2. Operating System Concept & Design, Milenkovic M, McGraw Hill. 3. Operating System, Stalling William, Maxwell MCMillan International Editions

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	C++ and Data Structure				
Course Code	**SMS04103**				
Semester	**M.Sc.- CS 1st**				
Course Credit	**L**	**T**	**P**	**T C**	
	3	**1**	**-**	**4**	
Prerequisites	To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.				
Course Objectives	• To carry out the Analysis Time and Space Complexity in different algorithms. • To explain the applications of Data Structures for various scenarios. • To relate data structures and algorithms with advanced computer science topics.				
Course Contents	**UNIT - I** INTRODUCTION :The Need for Data Structures - Costs and Benefits - Abstract Data Types and Data Structures - Mathematical Preliminaries - Sets and Relations -Miscellaneous Notation - Logarithms -Summations and Recurrences - Recursion - Mathematical Proof Techniques - Direct Proof - Proof by Contradiction - Proof by Mathematical Induction – Algorithm Analysis – Best, Worst, and Average Cases - Asymptotic Analysis - Upper Bounds – Lower Bounds - Notation - Calculating the Running Time for a Program – Analyzing Problems - Empirical Analysis. **UNIT - II** ELEMENTARY DATA STRUCTURES:List – Stacks – Queues – Binary Trees – Binary Search Trees – Huffman Coding Trees – Non – Binary Trees.				

	UNIT - III SORTING AND SEARCHING:Internal Sorting Techniques – Heap Sort – Quick sort – Merge Sort – Bin Sort and Radix Sort – Multi Way Merging - Time complexity Analysis of Sorting Techniques – Searching Unsorted and Sorted Arrays – Self – Organizing Lists – Hashing. **UNIT - IV** ADVANCED DATA STRUCTURES :Elementary Graph Algorithms – Minimum Spanning Tree – Single Source Shortest Path – All-Pairs shortest Path – Balanced Trees – AVL Trees- Red- Black Trees – Splay Trees – B-Trees – 1-2-3 Trees. **UNIT - V** ALGORITHMIC TECHNIQUES:Dynamic Programming – Greedy Algorithms – Number-Theoretic Algorithms – String Matching algorithms.Reductions - Hard Problems - The Theory of NP -Completeness – NP - Completeness Proofs - Coping with NP -Complete Problems – Impossible Problems – Unaccountability.
Course Outcomes	• Students who complete this course will be able to design correct and efficient algorithm for common computational tasks. • Analyze and design existing algorithms and data structures. • Apply amortized analysis on data structures, including binary search trees, mergable heaps and disjoint sets.
Text Books	1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning, 2009. 2. Clifford A. Shaffer, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Dover Publications, 2011.
Reference Books	1. Mark Allen Weiss, "Data Structure and Algorithm Analysis in C++", 3rd Edition, Prentice Hall, 2006. 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning, 2009.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	Programming With Java				
Course Code	**SMS04104**				
Semester	**M.Sc. – CS – 1st Sem**				
Course Credit	**L**	**T**	**P**	**T C**	
	3	**1**	**-**	**4**	
Prerequisites					
Course Objectives	1. To introduce the object-oriented programming concepts. 2. To understand object-oriented programming concepts, and apply them in solving problems. 3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes. 4. To introduce the implementation of packages and interfaces. 5. To introduce the concepts of exception handling and multithreading.				
Course Contents	**UNIT - I Object-Oriented Thinking**- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling. **UNIT-II Inheritance**– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. **UNIT - III Packages**- Defining a Package, CLASSPATH, Access protection, importing packages. Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.				

	Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics. **UNIT - IV Exception handling** - Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes. Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication. **UNIT - V GUI Programming with Swing** – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout. Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.
Course Outcomes	1.Able to solve real world problems using OOP techniques. Able to understand the use of abstract classes. 2.Able to solve problems using java collection framework and I/o classes. 3.Able to develop multithreaded applications with synchronization. 4.Able to develop applets for web applications. 5.Able to design GUI based application.
Text Books	1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
Reference Books	1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons 2. Introduction to Java programming, Y. Daniel Liang, Pearson Education. 3. Object Oriented Programming through Java, P. Radha Krishna, University Press. 4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press. 5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

<table>
<tr><td>Course Title</td><td colspan="5">Computer Graphics</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS04105</td></tr>
<tr><td>Semester</td><td colspan="5">M.Sc. CS- 1st Sem</td></tr>
<tr><td rowspan="2">Course Credit</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5"></td></tr>
<tr><td>Course Objectives</td><td colspan="5">Students will learn: (1) how to develop interactive programs that use effectively the graphics functionalities available in contemporary personal computers,
(2) the fundamental principles and technologies upon which these functionalities, and possibly their future evolutions, are based, and (3) the skills for designing and implementing practical graphic solutions to challenging problems in different application domains.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I Introductory concepts: Introduction of Coordinate representation and Pixel Graphics output devices: CRT, Raster Scan & Random Scan systems; Color CRT monitors, DVST, flat-panel displays, video controller and raster scan display processor. Graphics Input Devices: Keyboard, Mouse, Track-ball, space ball, Joysticks, data Glove, Light Pen, Digitizer, Image scanners, touch panels, voice systems; Graphics software
UNIT-II Graphics Output Primitives: Point and Lines, Line Drawing Algorithms: Simple, DDA, Bresenham's Line Drawing algorithm, Circle and Ellipse drawing algorithm, Polygon drawing: Representation of polygon; Conventional methods for drawing polygons; Real time Scan Conversion and Run length encoding; Filled area primitives, character generation, Antialiasing
UNIT-III 2D Viewing: Viewing pipeline, Window-to-viewport transformation, 2-D Clipping, Chen-Sutherland Line Clipping, Mid-point subdivision algorithm, Liang-Barsky clipping, Cyrus-Beck line clipping; Polygon Clipping: Sutherland-Hodgeman and Weiler-Atherton polygon clipping; Character Clipping.
Solid Body transformations, Projections: Perspective, Orthographic, Axonometric, Oblique projections
UNIT-V Advanced Topics: Curves and surfaces: Spline representations, Bezier curves and surfaces, B-spline curves and surfaces Visible surface detection methods: Back-face detection, depthbuffer, A-buffer, Z- buffer , scan-line Illumination models and surface rendering: Basic illumination models, Half-toning and dithering techniques, Polygon Rendering, Color models.</td></tr>
</table>

Course Outcomes	1. Know and be able to discuss hardware system architecture for computer graphics. This includes, but is not limited to graphics pipeline, frame buffers, and graphic accelerators/co-processors. 2. Know and be able to design and implement model and viewing transformations, the graphics pipeline and an interactive render loop with a 3D graphics API. 3. Know and be able to use the underlying algorithms, mathematical concepts, supporting computer graphics. These include but are not limited to: Composite 3D homogeneous matrices for translation, rotation, and scaling transformations. Plane, surface normals, cross and dot products. Hidden surface detection / removal Scene graphs, display lists 4. Know and be able to select and use among models for lighting/shading. 5. Know and be able to use and select among current models for surfaces (e.g., geometric; polygonal; hierarchical; mesh; curves, splines). 6. Be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications. 7. Be able to discuss future trends in computer graphics and quickly learn future computer graphics concepts and APIs.
Reference Books	1. Computer Graphics C Version, D. Hearn And P. Baker, Pearson Education 2. Computer Graphics, Foley and van Dam, Person Education 3. Computer Graphics with OpenGL, Hearn and Baker, Pearson 4. Procedural Methods for computer graphics, Rogers, TMH 5. Computer Graphics with virtual reality systems, R. K. Maurya, Wiley-India 6. Computer Graphics, Sinha & Udai, TMH

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	Programming with Java Lab				
Course Code	**SMS04191**				
Semester	**M.Sc. CS- 1st**				
Course Credit	**L**	**T**	**P**	**T C**	
	3	**1**	**-**	**4**	
Prerequisites					
Course Objectives	1. To write programs using abstract classes. To write programs for solving real world problems using java collection frame work. 2. To write multithreaded programs. 3. To write GUI programs using swing controls in Java. 4. To introduce java compiler and eclipse platform. To impart hands on experience with java programming.				
Course Contents	1. Program based on Basics. (At least5) 2. Program using if, nested if, Switch, loops & breaking loop statements. 3. Program that define classes, create objects, add methods. 4. Develop a program for each 5. Type caste 6. Wrapper 7. String 8. Vector class. 9. Programs to design and inherent and interface. 10. Program to handle an exception by using byTry-Catch-Finally 11. Program to generate own exception class 12. Programs by using multi-threading concept (At least 2) 13. Program using Applet tag in HTML file.				

Course Outcomes	1. Able to write programs for solving real world problems using java collection frame work. 2. Able to write programs using abstract classes. 3. Able to write multithreaded programs. 4. Able to write GUI programs using swing controls in Java.
Text Books	1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education. 2. Thinking in Java, Bruce Eckel, Pearson Education. 3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning. 4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF SCIENCE
Department of Computer Science & Engineering
M.Sc.-CS -1st Semester

Course Title	Computer Graphics Lab				
Course Code	**SMS04192**				
Semester	**M.Sc.- CS – 1st Sem**				
Course Credit	**L**	**T**	**P**	**T C**	
	3	**1**	**-**	**4**	
Prerequisites	Computer Graphics				
Course Objectives	1. Understand the need of developing graphics application 2. Learn algorithmic development of graphics primitives like: line, circle, polygon etc. 3. Learn the representation and transformation of graphical images and pictures.				
Course Contents	1. Implement various C Graphics Function 2. Implementation mouse in DOS 3. Implement DDA line algorithm 4. Implement Bresenham Line algorithm 5. Implement Bresenham Circle Algorithm 6. Implement Mid-point Ellipse algorithm 7. Implement Polygon Filling using Scan Fill, Flood Fill and Boundary Fill Algorithm 8. Implement algorithm of 2D Transformation of an Object 9. Implement Line Clipping using Cohen- Sutherland Algorithm 10. Implement Line Clipping using Liang-Barky algorithm 11. Implement Polygon Clipping using Sutherland-Hodgeman Algorithm 12. Implement Bezier Curve with C0, C1 continuity in OpenGL 13. Implement Illumination and shading apply on sphere using two light sources in OpenGL				

Course Outcomes	1. Draw Geometric primitives 2. Execute scan line polygon filling using OpenGL / C++ 3. Implement basic transformations on objects using OpenGL/C++ 4. Implement clipping algorithm on lines using OpenGL/C++
Text Books	1. Computer Graphics C Version, D. Hearn And P. Baker, Pearson Education 2. Computer Graphics, Foley and van Dam, Person Education 3. Computer Graphics with OpenGL, Hearn and Baker, Pearson 4. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, Pearson, 5 th Edition, 2009.
Reference Books	1. Procedural Methods for computer graphics, Rogers, TMH 2. Computer Graphics with virtual reality systems, R. K. Maurya, Wiley-India Computer Graphics, Sinha & Udai, TMH