PREM CHAND MARKANDA SD COLLEGE FOR WOMEN, JALANDHAR CITY

Re-accredited 'A^{+}' grade (2nd Cycle) by NAAC Bangalore

A unique prestigious Post Graduate Institution of Northern India

DEPARTMENT OF PG DEPARTMENT OF COMPUTER SCIENCE & IT

(Session 2025-26)

Program: MASTER OF SCIENCE IN COMPUTER SCIENCE

(Credit Based Grading System)

Program Outcome: PO No.	**Upon Completion of the Master of Science in Computer Science Programme, the Post graduates will be able to:**
PO.1	Develop in-depth knowledge of advanced computer science concepts such as algorithms, data structures, operating systems, databases, networks, and software engineering
PO.2	Design and develop software systems using modern programming languages, frameworks, and tools while following software engineering principles and best practices.
PO.3	Select, adapt, and apply modern computing tools, techniques, and platforms to develop scalable and efficient solutions.
PO.4	Demonstrate knowledge of project management, planning, budgeting, risk assessment, and leadership skills in computing-related projects.
PO.5	Identify, analyze, and solve complex computational problems using appropriate models, algorithms, tools, and techniques.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-I)
SUBJECT: Advanced Data Structures
Faculty Name: Ms. Vineet

TOPIC	DURATION	TEACHING TOOLS
Review of algorithm analysis, Binary search trees, balanced binary search trees (red-black trees), B-trees, AVL Trees, 2-3 trees, 2-3-4 trees Binary heaps, heap operations,implementation and applications. Priority queue operations, and double-ended priority queues.	**July-August**	● Technology based Learning ● Lecture based Teaching learning ● Experiential learning
Binomial heaps, Fibonacci heaps. Data structures for disjoint sets. Amortized analysis, string matching, and graph algorithms.	**September**	● Game-Based Learning ● Learning through Problem solving
External data structures - external storage, external files, external sorting searching indexing files,external hashing	**October**	● Peer Teaching ● Lecture Based Teaching Learning
Commencement of University Exams	**November**	

Course outcome

CO.1	Understand and analyze the time and space complexities of algorithms using standard algorithm analysis techniques.
CO.2	Apply binary heaps and priority queue operations to solve real-world problems including scheduling and simulation.
CO.3	Implement data structures for disjoint sets using union-find algorithms, and

	apply amortized analysis to evaluate algorithm efficiency over sequences of operations.
CO.4	Apply string matching algorithms and classical graph algorithms (DFS, BFS, shortest paths, MSTs) in solving computational problems efficiently
CO.5	Understand and implement external data structures and algorithms for handling large datasets, including external sorting, indexing, and searching techniques.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-I)
SUBJECT: Advanced Computer Architecture
Faculty Name: Ms. Inderjit Kaur

TOPIC	DURATION	TEACHING TOOLS
Paradigms of Computing: Synchronous– Vector/Array, SIMD, Systolic Asynchronous– MIMD, reduction Paradigm, Hardware taxonomy: Flynn's classification, Software taxanomy: Kung's taxanomy, SPMD.	**July-August**	● Technology -based learning ● Use of Projector
Parallel Computing Models Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.Parallel Computer Structures: Pipeline Computers, Array Computers,	**September**	● Technology-Based Learning ● Use of Online Vedios
Multiprocessor Systems Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining	**October**	● Model and experiments
Pipelining : An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors, General Pipelines and Reservation Tab	**November**	● Class Discussions ● Class Seminars

Course outcome

CO.1	Paradigms of Computing: Synchronous– Vector/Array, SIMD, Systolic
CO.2	Asynchronous– MIMD, reduction Paradigm, Hardware taxanomy: Flynn's classification, Software taxanomy: Kung's taxanomy, SPMD.
CO.3	Parallel Computing Models Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture
CO.4	Serial versus Parallel Processing, Parallelism versus Pipelining
CO.5	Pipelining : An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-I)
SUBJECT: Network Design & Performance Analysis
Faculty Name: Dr. Lovely Sharma

Topic	Duration	Teaching Tools
Requirements, planning, & choosing technology: System requirements, traffic sizing characteristics time & delay consideration. Network performance modeling- Creating traffic matrix, design tools, components of design tools, types of design projects. Traffic engineering and capacity planning: Throughput calculation traffic characteristics &source models, traditional traffic engineering, queued data & packet switched traffic modeling, designing for peaks, delay or latency	**July- August**	• Lecture based Teaching learning • Group Teaching & Learning • Technology based learning • Peer Teaching
Technology Comparisons- Generic packet switching networks characteristics, private vs. public networking, Business aspects of packet, frame and cell switching services, High speed LAN protocols comparison, Application performance needs, Throughput, burstiness, response time and delay tolerance, selecting service provider, vendor, service levels etc.	**September**	• Expeditionary learning • Technology based learning • Lecture based Teaching learning
Access Network Design- N/W design layers, Access N/W design, access n/w capacity, Backbone n/w design, Backbone segments, backbone capacity, topologies, Tuning the network, securing the network, Design for network security. Documentation and network management- Documentation, network management, SNMP, RMON	**October**	• Learning through problem solving • Lecture based Teaching learning • Technology based learning
Commencement of University Exams	**November**	

CO.1	**Network Designer** – Learn to design access and backbone networks, considering capacity, topologies, and security to meet business needs effectively.
CO.2	**Traffic Engineering Specialist** – Develop expertise in traffic modeling, throughput calculation, and latency management to optimize network performance during peak loads.
CO.3	**Technology Evaluator** – Compare private and public networking technologies, assess LAN protocols, and select vendors or service providers based on application requirements like throughput, response time, and delay tolerance.
CO.4	**Network Performance Analyst** – Master performance modeling, creating traffic matrices, and leveraging design tools to ensure efficient and scalable network solutions.
CO.5	**Security and Documentation Expert** – Gain skills in securing networks through robust designs and implementing SNMP and RMON for comprehensive network management and documentation.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-I)
SUBJECT: Soft Computing
Faculty Name: Ms. Deepika

TOPIC	DURATION	TEACHING TOOLS
Neural Networks: Introduction to neural networks, working of an artificial neuron, linear seperability, perceptron, perceptron training algorithm, back propagation algorithm, adalines and madalines. Supervised and unsupervised learning, counter-propagation networks.	**July-August**	• Learning through problem solving • Lecture based Teaching learning
Adoptive resonance theory, neocognitron and bidirectional associative memory. **Fuzzy Logic:** Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules. Applications of fuzzy logic, neuro-fuzzy systems and genetic algorithm.	**September**	• Lecture based Teaching learning • Group Teaching &Learning • Technology based learning • Peer Teaching
Probabilistic Reasoning: Introduction to probability theory, conditional probability, Baye's theorem, fuzzy logic and its relationship with probability theory.	**October**	• Learning through problem solving • Lecture based Teaching learning
Commencement of University Exams	**November**	

Course outcome

CO.1	Understand the fundamentals of neural networks, including perceptrons, artificial neurons, and training algorithms like backpropagation.
CO.2	Differentiate between supervised and unsupervised learning, and explore advanced architectures like ART, neocognitron, and BAM.
CO.3	Gain knowledge of fuzzy logic concepts, including fuzzy sets, fuzzy relations, fuzzy

	arithmetic, and rule-based systems.
CO.4	Explore real-world applications of fuzzy systems, neuro-fuzzy systems, and genetic algorithms.
CO.5	Understand probabilistic reasoning, including Bayes' theorem, and the relationship between fuzzy logic and probability theory.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-III)
SUBJECT: Advanced Software Engineering
Faculty Name: Prof. Shivani Sharma

TOPIC	DURATION	TEACHING TOOLS
Software Project Management: Fundamentals of Software project planning , Conventional Software Management, Evolution of Software Economics, Improvement of Software Economics, Comparison of old and modern ways of Software Management	July-August	• PowerPoint / Google Slides • Smart Board explanations of Information system Concepts
Introduction Re-engineering, Restructuring and Reverse Engineering, Reengineering existing systems, Data Re-engineering and migration, Software Reuse and Re-engineering. Object-Oriented (OO) Measurements: Introduction, Why metrics ?, Classification of OO metrics, Study of Design Metrics- method size, method internals, class size, class inheritance, Method inheritance, class intervals and class externals.	September	• Create diagrams for system design, information flow, network architecture • Show online material on IS concepts
Object-Oriented Analysis and Design: What is Object-Oriented Design ?, Object, Abstraction, Collaboration among Objects, Polymorphism, Classes, specifying State, Specifying Behavior, Class Relationships, Grouping, Hiding.	October	• Organize group discussions on MIS,TPS,OOS,DSS,Expert System • Give Assignment work to students
Software Agents: Definition, Applications, Types and Classes, Multi-Agent systems, characteristics & Properties Agents.	November	• Real-time quizzes, polls, and brainstorming

Course outcome

CO.1	Explain modern software engineering methodologies, including Agile, DevOps, and Model-Driven Engineering.
CO.2	Analyze and apply appropriate SDLC models (Agile, Spiral, Incremental, etc.) based on project requirements.
CO.3	Use estimation techniques like Function Point Analysis (FPA), COCOMO, and

	PERT/CPM for effort and cost estimation.
CO.4	Apply project management tools for scheduling, resource allocation, and risk management.
CO.5	Collaborate effectively in teams to develop and manage software projects.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-III)
SUBJECT: System Software
Faculty Name: Ms. Deepika

TOPIC	DURATION	TEACHING TOOLS
Introduction to System Software: Evolution of System Software, components of system software, Translators, loaders, interpreters, compiler, assemblers. **Assemblers:** Overview of assembly process, design of one pass and two assemblers **Macroprocessors:** Macro definition and expansion, concatenation of macro parameters, generations of unique labels, conditional macro expansion, Recursive macro expansion.	**July-August**	• Learning through problem solving • Lecture based Teaching learning
Compilers: Phases of compilation process, logical analysis, parsing, storage management optimisation. Incremental compilers, cross compilers, P code compilers.	**September**	• Lecture based Teaching learning • Group Teaching &Learning • Technology based learning • Peer Teaching
Loaders and Linkage Editors: Basic loader functions. Relocation, program linking, linkage, editors, dynamic linking bootstrap loaders. Other System Software: Operating system, DBMS, text editors, Interactive debugging systems.	**October**	• Learning through problem solving • Lecture based Teaching learning
Commencement of University Exams	**November**	

Course outcome

CO.1	Understand the evolution, components, and roles of system software including compilers, assemblers, loaders, and interpreters.

CO.2	Explain the assembly process and design principles of one-pass and two-pass assemblers.
CO.3	Analyze and apply macroprocessing concepts including macro definitions, expansions, and recursive macros.
CO.4	Understand the phases of compilation, including lexical analysis, parsing, optimization, and different types of compilers (incremental, cross, P-code).
CO.5	Describe the functionality of loaders, linkage editors, and other system software like OS, DBMS, text editors, and debugging systems.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-III)
SUBJECT: Data Mining and Warehousing
Faculty Name: Ms. Navjot Kaur

TOPIC	DURATION	TEACHING TOOLS
Data Warehousing: Concepts of Data Warehousing, Difference between operational database systems and Data warehousing, Need of a separate Data Warehouse. Multidimensional Data Model.	**July-August**	• Lecture based Teaching learning • Group Teaching &Learning • Technology based learning • Peer Teaching
Data Warehousing Architecture: Steps for Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture, Characteristics of Data Warehousing Data, Data Marts, Types of OLAP Servers: ROLAP, MOLAP, HOLAP; Difference between Online Transaction Processing and Online Analytical Processing	**September**	• Learning through problem solving • Lecture based Teaching learning
Data Warehouse Implementation: Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata Repository, Data Warehouse Back-End Tools and Utilities	**October**	• Learning through problem solving • Lecture based Teaching learning
Data Mining Basic Concepts; Data Mining Techniques: Predictive Modeling, Database Segmentation, Link Analysis, Deviation Detection in details. Data Mining Query Languages, Applications and Trends in Data Mining	**November**	• Learning through problem solving • Lecture based Teaching learning • Group Teaching &Learning • Technology based learning

Course outcome

CO.1	Students will be able to explain the fundamental concepts of Data Warehousing, its need, and differences from operational databases.
CO.2	Students will be able to analyze and design Data Warehouse architectures, including multidimensional models, OLAP servers, and data marts
CO.3	Students will be able to implement Data Warehouse components, such as data cubes, indexing, OLAP query processing, and metadata repositories.
CO.4	Students will be able to apply data mining techniques such as predictive modeling, segmentation, link analysis, and deviation detection.
CO.5	Students will be able to evaluate applications and trends in Data Mining and use data mining query languages for knowledge discovery.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-III)
SUBJECT: Concept of Core and Advanced Java
Faculty Name: Dr. Lovely Sharma

Topic	Duration	Teaching Tools
Java Fundamentals: Features, Objects Oriented Basis, Java Virtual Machine Character Set, Operators, Data Types, Control StructuresClasses, Inheritance, Polymorphism, Packages & Interfaces, Stream IO Classes, Exception Handling	**July- August**	• Lecture based Teaching learning • Group Teaching &Learning • Technology based learning • Expeditionary learning
Multithreading: Java Thread model, Thread Priorities, Synchronization, Interthread communication, Suspending, resuming & stopping thread.	**September**	• Expeditionary learning • Peer Teaching • Technology based learning
Applet: Applet basics, Applet architecture, Applet: Display, Repaint, Parameter Passing. Telnet, FTP, Web Server and their implementation in Java.	**October**	• Learning through problem solving • Inquiry based learning • Technology based learning
Commencement of University Exams	**November**	

Course Outcome

CO.1	Basics of Java programming, including data types, operators, and control structures, enabling foundational skills for building robust applications.
CO.2	Object-oriented principles (OOPs), including classes, objects, inheritance, and polymorphism, to design modular and reusable software systems.
CO.3	String manipulation, method overloading/overriding, and advanced OOP features

	like interfaces and packages, which are essential for large-scale application development.
CO.4	Exception handling techniques for error-free coding and multithreading for building concurrent and performance-oriented applications.
CO.5	File I/O operations for data handling and JDBC for connecting Java applications to databases like MySQL, a key skill for backend development.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: Master of Science in Computer Science (CBGS) (Sem-III)
SUBJECT: Network Programming
Faculty Name: Dr Inderjit Kaur

TOPIC	DURATION	TEACHING TOOLS
Sockets and Socket Address structures, Concept of Zombies, Daemon Processes, Super servers, Concurrent versus Iterative servers, Protocol Independence, Error Handling : Wrapper functions, OSI Model, Unix standards.	**July-August**	● Technology Based Learning
TCP Connection establishment & Termination, Port Numbers and Concurrent Servers, Protocol Usage by common Internet Applications. UDP Communication Semantics, UDP Echo Server, Echo Client working, Protocol Usage by Common Internet Applications.	**September**	● Learning through computer system ● Technology-Based Learning
Sockets Address Structures, Byte ordering & Manipulation Functions, TCP Socket System Calls, TCP Client-Server E.g., I/O Multiplexing,	**October**	● Computer practical
Signal Handling in Concurrent Servers. Socket Options, Elementary Names Address Conversions, Ipv4 and Ipv6 Interoperability.	**November**	● Learning through computer system Technology-Based Learnin

Course outcome

CO.1	Sockets and Socket Address structures, Concept of Zombies, Daemon Processes, Super servers, Concurrent versus Iterative servers, Protocol Independence, Error Handling , OSI Model, Unix standards.
CO.2	TCP Connection establishment & Termination, Port Numbers and Concurrent Servers, Protocol Usage by common Internet Applications.
CO.3	UDP Communication Semantics, UDP Echo Server, Echo Client working, Protocol Usage by Common Internet Applications.
CO.4	Sockets Address Structures, Byte ordering & Manipulation Functions, TCP Socket System Calls
CO.5	TCP Client-Server E.g., I/O Multiplexing, Signal Handling in Concurrent Servers. Socket Options, Elementary Names Address Conversions, Ipv4 and Ipv6 Interoperability