FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS FOR THE BATCH FROM YEAR 2025 TO YEAR 2027

FOR

MASTER OF SCIENCE IN COMPUTER SCIENCE (Credit Based Grading System)

SEMESTER: I – IV

EXAMINATIONS: 2025-27

GURU NANAK DEV UNIVERSITY, AMRITSAR

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Master of Science in Computer Science (CBGS)

Syllabus for the Batch from Year 2025 to 2027

SEMESTER – I

		Credits			
Subject Code	**Paper Name**	**L**	**T**	**P**	**Marks**
MCS01001T	Advanced Data Structures	4	0	0	100
MCS01002T	Advanced Computer Architecture	4	0	0	100
MCS01003T	Network Design & Performance Analysis	4	0	0	100
MCS01004T	Discrete Structures	4	0	0	100
MCS01005T	Soft Computing	4	0	0	100
MCS01006L	Programming Laboratory - I (Programs based on Advanced Data Structures using C/C++)	0	0	2	50
	Sub Total	20	0	2	
	Grand Total	**22**			**550**

SEMESTER – II

		Credits			
Subject Code	**Paper Name**	**L**	**T**	**P**	**Marks**
MCS02001T	Theory of Computation	4	0	0	100
MCS02002T	Image Processing	4	0	0	100
MCS02003T	Design & Analysis of Algorithms	4	0	0	100
MCS02004T	Cloud Computing	4	0	0	100
MCS02005T	Distributed Database Systems	4	0	0	100
MCS02006L	Programming Laboratory – II	0	0	2	50
	Sub Total	20	0	2	
	Grand Total	**22**			**550**

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Syllabus for the Batch from Year 2025 to 2027

SEMESTER – III

		Credits			
Subject Code	**Paper Name**	**L**	**T**	**P**	**Marks**
MCS03001T	Advanced Software Engineering	4	0	0	100
MCS03002T	System Software	4	0	0	100
MCS03003T	Data Mining and Warehousing	4	0	0	100
MCS03004T	Concept of Core and Advanced Java	4	0	0	100
MCS03005T	Network Programming	4	0	0	100
MCS03006L	Programming Laboratory - III (Based on Advanced Java and Network Programming)	0	0	2	50
	Sub Total	20	0	2	
	Grand Total	**22**			**550**

SEMESTER – IV

		Credits			
Subject Code	**Paper Name**	**L**	**T**	**P**	**Marks**
MCS04001T	Advanced Web Technologies	4	0	0	100
MCS04002T	Microprocessor and Its Applications	4	0	0	100
MCS04003T	Object Oriented Modeling, Analysis and Design	4	0	0	100
MCS04004L	Programming Laboratory – IV (Based on Advanced Web Technologies using ASP.NET)	0	0	2	50
MCS04005L	Project Work	0	0	10	250
	Sub Total	12	0	12	
	Grand Total	**24**			**600**

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Syllabus for the Batch from Year 2025 to 2027

SEMESTER – I
MCS01001T: Advanced Data Structures

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A
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.

SECTION-B
Binary heaps, heap operations, implementation and applications. Priority queue operations, and double-ended priority queues.

SECTION-C
Binomial heaps, Fibonacci heaps. Data structures for disjoint sets.

Amortized analysis, string matching, and graph algorithms.

SECTION-D
External data structures - external storage, external files, external sorting searching indexing files, external hashing.

References:

1. Alfred V. Aho, Jeffrey D. Uuman, John E. Hopcroft, “Data Structures and Algorithms” Addision Wesley, 1983.
2. Dinesh P. Mehta, I. Sartaj Sahni, “Handbook of Data Structures and Applications”, Chapman & Hall/CRC, 2004.
3. Sorenson and Trembley, “An Introduction to Data Structures with Applications, McGraw Hill, 2006 Edition.

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SEMESTER – I
MCS01002T: Advanced Computer Architecture

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A
Paradigms of Computing: Synchronous – Vector/Array, SIMD, Systolic

Asynchronous – MIMD, reduction Paradigm, Hardware taxanomy: Flynn's classification, Software taxanomy: Kung's taxanomy, SPMD.

SECTION-B
Parallel Computing Models

Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.

SECTION-C
Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining

SECTION-D
Pipelining : An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors, General Pipelines and Reservation Tables

References
1. *Computer Architecture and Parallel Processing*, Faye A. Briggs, McGraw-Hill International, 2007 Edition
2. *Computer Systems Organization & Architecture*, John d. Carpinelli, Addison Wesley, 2007 Edition.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – I
MCS01003T: Network Design & Performance Analysis

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A

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.

SECTION-B

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

SECTION-C

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.

SECTION-D

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

References:

1. James D. McCabe, Network Analysis, Architecture and Design, 2nd Edition, Morgan Kaufman Series in Networking, 2007 Edition.
2. Youeu Zheng, Shakil Akhtar, Network for Computer Scientists and Engineers, Indian University, Oxford University Press, 2007 Edition.
3. A. Forouzan, Data Communications and Networking, Tata McGraw Hill, 2007 Edition.

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SEMESTER – I
MCS01004T: Discrete Structures

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. **The student can use only Non-programmable & Non-storage type calculator.**

SECTION-A

Sets and Functions:
Sets, Relations, Functions, Pigeonhole principle, Inclusion - Exclusion Principle, Equivalence and Partial orderings, Elementary counting techniques, relation of partial order partitions, binary relations.

SECTION-B

Graph Theory:
Definition, Walks, Paths, Directed and Undirected graphs, connected graphs, regular and bipartite graphs, Eulerian chains and cycles. Hamiltonian chains and cycles, planar graphs, Trees and rooted tree, Spanning trees, Chromatic number Connectivity and other graphical parameter application.

SECTION-C

Combinatorial Mathematics:
Basic counting principles Permutations and combinations, Recurrence relations, generating Function, Application.

SECTION-D

Rings and Boolean algebra: Rings Subrings morphism of rings ideals and quotient rings. Euclidean domains Integral domains and fields Boolean Algebra direct product morphisms Application of Boolean algebra in logic circuits and switching functions.

References:

1. Ehrig, H., Mahr, B. Fundamentals of Algebraic Specification I, EATCS Monographs on Theory. Comp. Sc. Vol. 6 spinger, Berlin 1985.
2. Gersting J. Mathematical Structures for Computer Science, W.H. Freman, New York, 1987.
3. Gibons, A. Algorithmic Graph theory Cambridge University Pres, 1985.
4. Knuth, D.E. The art of Computer Programming Vol. I: Fundamental Algorithms. 2nd ed. Reading, Mas, Adison Wesley 1973.
5. Kolman B. Busby R. Discrete Mathematical Structures for Computer Science, Prentice Hall Englewod Clifs. 1987.
6. Sahni, S. Concepts in Discrete Mathematics Fridley MN., Camelot Publ. Comp., 1981.
7. Schmidt G. Strohlein T. Relations Graphs Program, EATS Monograph on Theor. Comp. Sc. Vol. 29 Berlin Spinger 1993.
8. Wheler W. Universal Algebra for Computer Scientist EATCS Monographs on Theor. Comp. Sc. Vol. 25 Spinger-Verlag, Berlin 191.

SEMESTER – I
MCS01005T: Soft Computing

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A

Neural Networks
Introduction to neural networks, working of an artificial neuron, linear seperability, perceptron, perceptron training algorithm, back propagation algorithm, adalines and madalines.

SECTION-B

Supervised and unsupervised learning, counter-propagation networks, adoptive resonance theory, neocognitron and bidirectional associative memory.

SECTION-C

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.

SECTION-D

Probabilistic Reasoning
Introduction to probability theory, conditional probability, Baye's theorem, fuzzy logic and its relationship with probability theory.

References:

1. Elements of artificial neural networks by Kishan Mehrotra, Chilkuri K. Mohan and Sanjay Ranka, 2007 Edition.
2. Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India, 2007 Edition.
2. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India, 2007 Edition.
3. Fuzzy logic, intelligence, control and information by John Yen and Reza Langari, Pearson Education, 2007 Edition.
4. Probability and statistics by Murray R. Spiegel, John Schiller and R. Alu Srinivasan, Schaum's Outlines, Tata McGraw Hill Publishing Company Limited, 2007 Edition.

SEMESTER – I

MCS01006L: Programming Laboratory - I

Max. Marks: 50

Credits		
L	**T**	**P**
0	**0**	**2**

Programs based on Advanced Data Structures using C/C++

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SEMESTER – II
MCS02001T: Theory of Computation

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A
Operations on Languages: Closure properties of Language Classes. Context Free Languages: The Chomsky Griebach Normal Forms. Linear Grammars and regular Languages. Regular Expressions Context Sensitive Languages; The Kuroda Normal Form, One sided Context Sensitive Grammars.

SECTION-B
Unrestricted Languages: Normal form and Derivation Graph, Automata and their Languages: Finite Automata, Push down Automata and Turing Machines, The Equivalence of the Automata and the appropriate grammars.

SECTION-C
Syntax Analysis: Formal Properties of LL(k) and L.R.(k) Grammars.

SECTION-D
Derivation Languages: Rewriting Systems, Algebraic properties, Canonical Derivations, Context Sensitivity.

References:

1. G.E. Reevsz, Introduction to Formal Languages, McGraw Hill 1983.
2. M.H. Harrison, Formal Language Theory Wesley 1978.
3. Wolfman Theory and Applications of Cellular Automata, World Scientific, Singapore, 1986.
4. K.L.P. Mishra, N. Chandrasekaran, Theory of Computer Science (Automata, Languages and Computation), 2nd Edition, Prentice Hall of India, 2006.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – II
MCS02002T: Image Processing

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A
Background: Introduction to electronic systems for image transmission and storage, computer processing and recognition of pictorial data, overview of practical applications.

SECTION-B
Fundamentals: Mathematical and perceptual preliminaries, human visual system model, image signal representation, imaging system specification building image quality, role of computers, image data formats.

SECTION-C
Image Processing Techniques: Image enhancement, image restoration, image data compression and statistical pattern recognition.
Applications of Image Processing: Picture data archival, machine vision, medical image processing.

SECTION-D
Techniques of Colour Image Processing: Colour image signal representation, colour system transformations, extension of processing techniques to colour domain.

References:

1. Pratt, W.K. Digital Image Processing, John Wiley, N.Y./1978.
2. Rosenfield, A and Kak, A.C., Picture processing, Academic Press N.Y., 1982.
3. Jain, A.K., Fundamentals of Digital Image Processing, Englewood Cliffs, Prentice Hall, 1989.
4. Chris Soloman, Stuart Gibson, Fundamentals of Digital Image Processing: A Practical Approach using MatLab, John Wiley and Sons, 2007.
5. Digital Image Processing by Gonzalez & Wood, Addison Wesley, 2000.

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SEMESTER – II
MCS02003T: Design & Analysis of Algorithms

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A
Introduction: Concept of Algorithm, Algorithm Specification, Performance Analysis (Time and space complexities), Asymptotic Notations.

SECTION-B
Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Quick Sort, Selection.

SECTION-C
Greedy Method: General Method, Knapsack Problem,, Minimum Cost Spanning Trees (Prim's Algorithm, Kruskal's Algorithm) and Sibnngle-Source Shortest Path.

SECTION-D
Dynamic Programming: General Single Method, Multistage Graphs, All Pairs Shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Tress, 0/1 Knapsack and Travelling Saleman Problem.

Backtracking: General Method, 8-Queens Problem, Graph Coloring and Hamiltonian Cycles.
Search and Traversal Technique: Techniques for Binary Trees, Techniques for Graphs.

References:

1. V. Aho, J.E. Hopcroft, J.D. Ullman, Design and Analysis of Algorithms, Addison Wesley, 1976.
2. Horowitz, S. Sahni, Fundamentals of Computer Algorithms, Galgotia Publishers, 1984.
3. K. Mehlhorn, Data Structures and Algorithms, Vols. 1 and 2, Springer Verlag, 1984.
4. Purdom, Jr. and C. A. Brown, The Analysis of Algorithms, Holt Rinechart and Winston, 1985.
5. D. E. Kunth, The Art of Computer Programming, Vols. I and 3, Addison Wesley, 1975.
6. Anany Levitin, Introduction to the Design & Analysis of Algorithms, Addison, Wesley, 2002.

Master of Science in Computer Science (CBGS)
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SEMESTER – II
MCS02004T: Cloud Computing

Time: 3 Hrs. **M. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters: -
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

SECTION-A

Introduction: Definition, Vision, Reference Model, Benefits, Limitations, Terminology, Open Challenges.
Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance.

SECTION-B

Cloud Computing Architecture: Service Models, Deployment Models, Cloud Entities, Cloud Clients, Service Level Agreement (SLA) and Quality of Service (QoS) in Cloud Computing.

SECTION-C

Programming Models in Cloud: Thread Programming, Task Programming and Map–Reduce Programming.
Cloud Security: Infrastructure Security, Data Security, Identity and Access Management, Privacy Management, Security as a Service on Cloud.

SECTION-D

Advance Topic in Cloud: Energy Efficiency in cloud, Market Oriented Cloud Computing, Big– Data Analytics, Federated Cloud Computing.

Textbooks:

1. RajkumarBuyya, Christian Vecchiola and Thamarai Selvi, Mastering Cloud Computing: Foundation and Application Programming, Tata McGraw Hill, ISBN–13: 978–1–25–902995–0, New Delhi, India, Feb 2013.
2. Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy, O'Reilly,ISBN–13: 978–8–18–404815–5.

Reference Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., ISBN–13: 978–8–12–652980–3, New Delhi, India, 2011.
2. Dr. Saurabh Kumar, Cloud Computing: Insights Into New–Era Infrastructure, Wiley India Pvt. Ltd, ISBN–13: 978–8–12–652883–7, New Delhi, India, 2011.
3. Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Cloud Computing for Dummies, Wiley India Pvt. Ltd, ISBN–13: 978–0–47–059742–2, New Delhi, India, 2011.

Master of Science in Computer Science (CBGS)
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SEMESTER – II
MCS02005T: Distributed Database Systems

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters: -
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. **The student can use only Non-programmable & Non-storage type calculator.**

SECTION-A
Introduction to distributed databases, comparison of distributed and centralized systems, DDBMS, global relations, fragment and physical image, types of schemas, methods of fragmentation of a relation, levels of transparency in a distributed system, integrity constraints.

SECTION-B
Representation of database operation in form of a query, operation in form of a query, operations on a query, unary and binary tree in a query, converting a global query into fragment query, join and union operations involving a query, aggregate functions, and parametric queries.

SECTION-C
Introduction to query optimization, estimation of profiles of algebraic operations, optimization graphs, reduction of relation using semi-join and join operation.

Properties and goals of transaction management, distributed transactions, recovery mechanism in case of transaction failures, log based recovery, check pointing, and communication and site failures in case of a transaction and methods to handle them, serializability and timestamp in distributed databases.

SECTION-D
Introduction to distributed deadlocks, local and global wait for graphs, deadlock detection using centralized and hierarchical controllers, prevention of deadlocks, 2 and 3 phase locking and commitment protocols, reliability in commitment and locking protocols, reliability and concurrency control, reliability and removal of inconsistency.
Distributed database administration, authorization and protection in distributed databases, distributed database design, heterogeneous database system.

References:

1. Distributed Databases Principles and Systems by Stefano Ceri and Guiseppe Pelagatti, McGraw-Hill International Editions, 2004.
2. Distributed Database Systems by David Bell, Jame Grimson, Addison-Wesley, 1992.
3. M.Tamer Ozsu, Patrick Valdureiz, ‘Principles of Distributed Database Systems’ Second Edition, Prentice Hall, 2002.
4. Romez Elmasri, Shamkant B.Navathe, ‘Fundamentals of Database Systems’ Pearson Education, 2005.
5. Silberschatz, Korth, Sudershan “Database System Concepts” 4th Ed. McGraw Hill, 2006.
6. Connolly & Begg “Database Systems – A practical approach to Design, Implementation and Management, 3rd Ed. Pearson Education, 2005.

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SEMESTER – II

MCS-206 P
MCS02006L: Programming Laboratory – II

Max. Marks: 50

Credits		
L	**T**	**P**
0	**0**	**2**

Implementations based on Design & Analysis of Algorithms OR Image Processing OR Distributed Database Systems OR Cloud Computing.

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SEMESTER – III
MCS03001T: Advanced Software Engineering

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A

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.

Section B

Software Re-engineering: Introduction Re-engineering, Restructuring and Reverse Engineering, Re-engineering 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.

Section C

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.

Section D

Software Agents: Definition, Applications, Types and Classes, Multi-Agent systems, characteristics & Properties Agents.

References:

1. Software project management, Walker Royce, Pearson Education Inc.
2. Software Re-engineering, Robert S. Arnold IEEE Comp. Society.
3. Object Oriented Software Metrics, Lorenz and Kidd.
4. Object-Oriented Analysis and Design, Booch.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – III
MCS03002T: System Software

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A

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.

Section B

Macroprocessors: Macro definition and expansion, concatenation of macro parameters, generations of unique labels, conditional macro expansion, Recursive macro expansion.

Section C

Compilers: Phases of compilation process, logical analysis, parsing, storage management optimisation. Incremental compilers, cross compilers, P code compilers.

Section D

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.

References:

1. Leland L. Beck: System Software, An introduction to system programming, Addison Wesley.
2. D.M. Dhamdhere: Introduction to System Software, Tata McGraw Hill.
3. D.M. Dhamdhere: System Software and Operating System, Tata McGraw Hill, 1992.
4. Madrich, Stuarte: Operating Systems, McGraw Hill, 1974.
5. Stern Nancy Assembler Language Programming for IBM and IBM compatible computers, John Wiley, 1991.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – III
MCS03003T: Data Mining and Warehousing

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A

Data Warehousing:
Concepts of Data Warehousing, Difference between operational database systems and Data warehousing, Need of a separate Data Warehouse. Multidimensional Data Model.

Section B

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

Section C

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

Section D

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.

References:

1. Han, Kamber *"Data Mining: Concepts and Techniques"* Morgan Kaufmann.
2. Romez Elmasri, Shamkant B.Navathe, *"Fundamentals of Database Systems"* Pearson Education.
3. Silberschatz, Korth, Sudershan *"Database System Concepts"* 4th Ed. McGraw Hill
4. Connolly & Begg *"Database Systems – A Practical Approach to Design, Implementation and Management*", 3rd Ed., Pearson Education.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – III
MCS03004T: Concept of Core and Advanced Java

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A

Java Fundamentals: Features, Objects Oriented Basis, Java Virtual Machine

Character Set, Operators, Data Types, Control Structures

Section B

Classes, Inheritance, Polymorphism, Packages & Interfaces, Stream IO Classes, Exception Handling,

Section C

Multithreading: Java Thread model, Thread Priorities, Synchronization, Interthread communication, Suspending, resuming & stopping thread.

Section D

Applet: Applet basics, Applet architecture, Applet: Display, Repaint, Parameter Passing.

Telnet, FTP, Web Server and their implementation in Java.

References:

1. Complete Reference: Java, Herbet Schildt & Naughton, Tata Mc Graw, 5Th Edition, 2006.
2. Java Unleashed, Jane Jawoske, SAM5, Tech Me dia 2006.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – III
MCS03005T: Network Programming

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A
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.

Section B
TCP Connection establishment & Termination, Port Numbers and Concurrent Servers, Protocol Usage by common Internet Applications.

Section C
UDP Communication Semantics, UDP Echo Server, Echo Client working, Protocol Usage by Common Internet Applications.

Section D
Sockets Address Structures, Byte ordering & Manipulation Functions, TCP Socket System Calls, TCP Client-Server E.g., I/O Multiplexing, Signal Handling in Concurrent Servers.

Socket Options, Elementary Names Address Conversions, Ipv4 and Ipv6 Interoperability.

References:

1. Networking Programming, W. Richard Stevens, Pearson Education.
2. Advanced Programming in UNIX Environment, W. Richard Stevens, Pearson Education.

SEMESTER – III

MCS03006L: Programming Laboratory – III

Max. Marks: 50

Credits		
L	**T**	**P**
0	**0**	**2**

Programming Laboratory based on Advanced Java and Network Programming

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – IV
MCS04001T: Advanced Web Technologies

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A

Fundamentals of Web Development: Introduction to HTML, CSS, JAVA SCRIPT (Client side scripting), Server Site Development using PHP and ASP.NET.
Standard Controls: Display information, Accepting user input, Submitting form data, Displaying images, Using the panel control, Using the hyperlink control.

Section B

Validation Controls: Using the required field validator control, Using the range validator control using the compare validator control, Using the regular expression validator control, Using the custom validator control, Using the validation summary controls.
Rich Controls: Accepting file uploads, Displaying a calendar, Displaying advertisement, Displaying different page views, Displaying a wizard.

Section C

Designing Website with Master Pages: Creating master pages, Modifying master page content, Loading master page dynamically.
SQL Data Source Control: Creating database connections, Executing database commands, Using ASP.NET parameters with the SQL data source controls, Programmatically executing SQL data source commands, Cashing database data with the SQL data Source controls.
List Controls: Dropdown list control, Radio button list controls, list box controls, bulleted list controls, custom list controls.
Grid View Controls: Grid view control fundamentals, Using field with the grid view control, Working with grid view control events extending the grid view control.

Section D

Building Data Access Components with ADO.NET: Connected the data access, Disconnected data access, Executing a synchronous database commands, Building data base objects with the .NET framework.
Maintaining Application State: Using browser cookies, Using session state, Using profiles.
Caching Application Pages and Data: page output caching, partial page caching, data source caching, data caching, SQL cache dependences.

Reference:

ASP.NET 3.5: **Stephen Walther, Pearson Education, 2005**

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – IV
MCS04002T: Microprocessor and Its Applications

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A
Introduction: Introduction to Microprocessor, General Architecture of Microcomputer System. Microprocessor Units, Input unit, Output unit, Memory unit and auxiliary storage unit.

Section B
Architecture of 8086/8088 Microprocessor: Description of various pins, configuring the 8086/8088 microprocessor for minimum and maximum mode systems, Internal architecture of the 8086/8088 microprocessor, system clock, Bus cycle, Instruction execution sequence.

Section C
Memory Interface of 8086/8088 Microprocessor: Address space and data organization, generating memory addresses hardware organization of memory address space, memory bus status code, memory control signals, read/write bus cycles, program and data
storage memory, dynamic RAM system.

Section D
Input/Output Interface of the 8086/8088 Microprocessor: I/O interface, I/O address space and data transfer, I/O instructions, I/O bus cycles, Output ports, 8255A Programmable Peripheral Interface (PPI), Serial communication interface (USART and UART) – the RS- 232 C interface.

Interrupt Interface of 8086/8088 Microprocessor, Types of Interrupt, Interrupt Vector Table (IVT).

References:

1. Walter Triebel: The 8086 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
2. Walter Triebel: The 8088 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
3. Douglas V. Hall: Microprocessors and Interfacing – Programming and Hardware, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Peter Abel: IBM PC Assembly Language and Programming, PHI, Delhi.

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – IV
MCS04003T: Object Oriented Modeling, Analysis and Design

Time: 3 Hrs. **Max. Marks: 100**

Credits		
L	**T**	**P**
4	**0**	**0**

Instructions for the Paper Setters:-
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.
The student can use only Non-programmable & Non-storage type calculator.

Section A
Object Orientation, OMT Methodology, Object and Class, Link and Association Generalization, Aggregation Multiple Inheritance, Packages,

Section B
Object Meta Modeling, Metadata and Metamodels, Functional Modeling Pseudocode with the Object navigation Notation, ONN Constructs, Combining ONN Constructs.

Section C
Analysis: Object Model, Data Dictionary, Dynamic Model, Functional Model.

Section D
System Design:- Devising an Architecture, Database Management Paradigm, Object Model, Elaborating the functional Model, Evaluating the Quality of Design Model.

Reference:

Object Oriented Modeling and Design By Michael Blaha, William Premerlani, and Prentice Hall.

Master of Science in Computer Science (CBGS)
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SEMESTER – IV

MCS04004L: Programming Laboratory – IV

Max. Marks: 50

Credits		
L	**T**	**P**
0	**0**	**2**

Based on Advanced Web Technologies using ASP.NET

Master of Science in Computer Science (CBGS)
Syllabus for the Batch from Year 2025 to 2027

SEMESTER – IV

MCS04005L: Project Work

Max. Marks: 250

Credits		
L	**T**	**P**
0	**0**	**10**

1. Candidates have to submit only one hard copy and CD of documentation which shall be kept with the course supervisor/guide in the college only. Further, supervisor/guide OR principal of college shall forward two copies of DVD (Digital Versatile Disk) containing all the documentation files of the students (file name to be saved as Rollno_of_the_ student .pdf) to the concerned branch of the University. Covering letter (duly signed by the principal/Head of the college/institute) should contain the following information.
   Candidate name, Candidate Roll no, Project Title of the student and .pdf file name of his project documentation.
2. *The assignment shall be evaluated by a board of three examiner (two (02) External examiners and one (01) internal examiner) as approved by the BOS.*
3. The Project is to be submitted as per the common ordinances for P.G. courses under semester system.