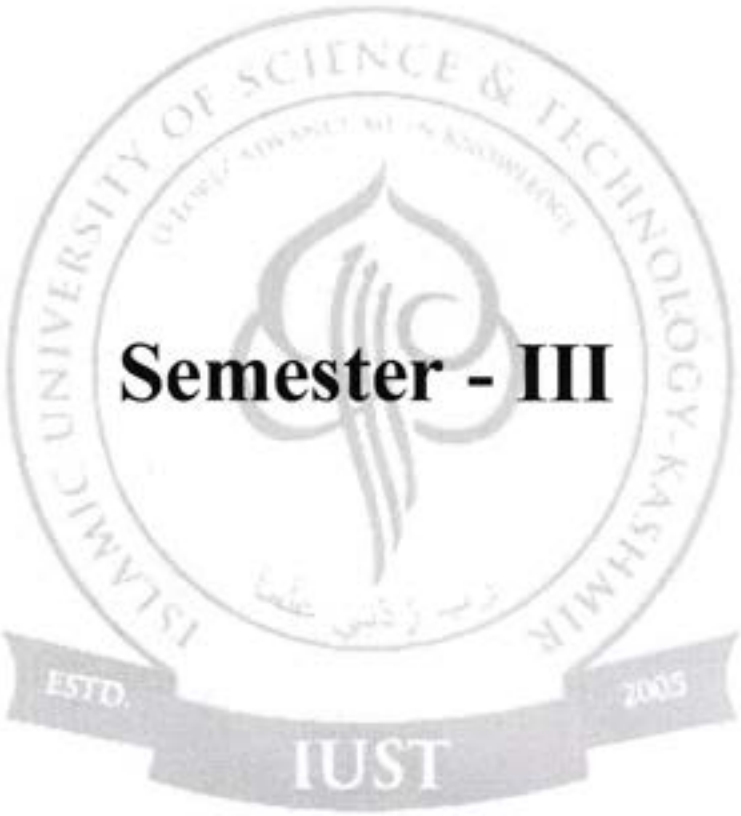

Semester - III

Semester-III (26 Credit Semester)						
Course Code	Course Name	Paper category	Hours / Week			Credits
			L	T	P	
18 Core Credit Units						
MCA-3T1-C	Analysis and Design of Algorithms	Core	2	1	4	5
MCA-3T2-C	Object Oriented Analysis and Design	Core	2	1	4	5
MCA-3T3-C	Data Communication & Computer Networks	Core	3	1	0	4
MCA-3T4-C	Artificial Intelligence	Core	3	1	0	4
6 Elective Credit Units						
Pool A: 3 Elective Credit Units						
MCA-3E1-DCE	Advanced Operating Systems	DCE	2	1	0	3
MCA-3E2-DCE	Distributed Databases	DCE	2	1	0	3
MCA-3E3-DCE	Bioinformatics	DCE	2	1	0	3
MCA-3E4-DCE	Soft Computing	DCE	2	1	0	3
MCA-3E5-DCE	System Programming	DCE	2	1	0	3
MCA-3E6-DCE	Natural Language Processing	DCE	2	1	0	3
Pool B: 3 Elective Credit Units						
MCA-3E7-DCE	Digital Image Processing	DCE	2	0	2	3
MCA-3E8-DCE	Linux System Programming	DCE	2	0	2	3
MCA-3E9-DCE	Data Warehousing	DCE	2	0	2	3
MCA-3E10-DCE	Open Source Technologies	DCE	2	0	2	3
MCA-3E11-DCE	Introduction to Python	DCE	2	0	2	3
MCA-3E12-DCE	Dot Net	DCE	2	0	2	3
2 credit units to be taken from outside departments						

Course Title:	Analysis & Design of Algorithms	**Course Code:**	MCA-3T1-C
Semester:	3rd	**Paper Type:**	Core
Credits:	05	**Max Marks:**	125
Pre Requisite:	MCA-1T1-C, MCA-2T1-C	**Co-Requisite:**	MCA-3T2-C, MCA-3T4-C

Marks Distribution: (Mid Term:30, End Term:50, Lab:25, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVE:

The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case, emphasis will be on rigorously proving correctness of the algorithm. In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naive techniques.

COURSE CONTENT:

UNIT I

Algorithms: Introduction, Importance, Performance Analysis, Designing Algorithms, Growth of Functions, Asymptotic Notations, Solving Recurrences. Review of Data Structures: Stacks, Queues, Trees, Graphs & Hashing.

UNIT II

Divide & Conquer: General Method, Binary Search, MinMax Problem, Merge Sort, Quick Sort, Strassen's Matrix Multiplication. Greedy Method: General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Pattern, Single Source Shortest Paths.

UNIT III

Dynamic Programming: General Method, Multistage Graphs, All Pair Shortest Paths, Traveling Salesperson Problem. Backtracking: General Method, N-Queen Problem, Sum of Subsets Problem, Graph Coloring, 0-1 Knapsack Problem.

UNIT IV

Branch & Bound: General Method, Least Cost Branch & Bound, 8-Queen Problem. Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions, P & NP Problems, NP Hard & NP Complete Problems, Handling of NP Hard Problems. Parallel Algorithms: Basic Concept, Architectures, Effect of Parallelism.

Course Title:	Object Oriented Analysis and Design	**Course Code:**	MCA-3T2-C
Semester:	3rd	**Paper Type:**	Core
Credits:	05	**Max Marks:**	125
Pre Requisite:	MCA-1T1-C, MCA-2T1-C	**Co-Requisite:**	MCA-3T1-C, MCA-3T4-C

Marks Distribution: (Mid Term:30, End Term:50, Lab:25, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVE:

- *To understand the definition of problems, requirements specification and the relationship between the specification and the real-world*
- *To Understand systems specification, modelling and a superior functional design and a variety of systems development strategies*
- *To understand the process of transforming Use Cases into Object Oriented software Realizations through OO Analysis and OO Design.*
- *To Understand the essential and fundamental aspects of object-oriented analysis and design, in terms of "how to use" it for the Purpose of specifying and developing software.*

COURSE CONTENT:

UNIT I

Introduction to OOAD, Structures Design & Unified Process, Class & objects, effect of inheritance on polymorphism & variable declarations, concepts that define object orientation.

UNIT II

Requirements: Developing requirements, reviewing requirements, managing requirements, Difficulties & risks in domain & requirement analysis, requirement documents
UML diagrams, Use Case Diagrams, System sequence diagrams, Relationship between sequence diagrams and use cases, Class Diagrams, Interaction Diagrams, State Diagrams, Difficulties & risks in creating class diagram.

UNIT III

Activity Diagrams, Package, component and Deployment Diagrams: Case study – the Next Gen POS system. Architecting & Designing Software: The process of design, design principles, User interface design. GRASP: Designing objects with responsibilities, Creator, Information expert, Low Coupling, High Cohesion, Controller, Design patterns – Singleton, observer, adapter, Façade, Proxy with examples.

UNIT IV

Mapping design to code: Testing: Issues in OO Testing, Class Testing, OO Integration Testing, GUI Testing, & OO System Testing.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Demonstrate the importance of modelling in the software development life cycle.*
- *Become familiar with the Unified modelling Language.*
- *Understand the object-oriented approach to analysing and designing systems and software solutions. Employ the Unified modelling Language notations to create effective and efficient system designs.*
- *Understand the difference between writing programs for the software and doing analysis and design.*
- *Problem formulation and decomposition (analysis) and solution building (design) will be covered.*

Text Books:

1. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition By Craig Larman
2. Analysis Patterns Reusable Object Models, Martin Fowler
3. Design Patterns: Elements of Reusable Object-Oriented Software Book by Erich Gamma, John Vlissides, Ralph Johnson, and Richard Helm

References:

1. Object Oriented Analysis & Design With Applications (Grady Booch ,Robert A.Maksimchuk)
2. Head First-Objected Oriented Analysis & Design
3. Object-Oriented Analysis & Design Using UML (D Jeya Mala, Mc Graw Hill Education)

Course Title:	Data Communication & Computer Networks	**Course Code:**	MCA-3T3-C
Semester:	3rd	**Paper Type:**	Core
Credits:	04	**Max Marks:**	100
Pre Requisite:	MCA-1B1-BC, MCA-1T2-C	**Co-Requisite:**	MCA-3T2-C

Marks Distribution: (Mid Term:30, End Term:50, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To understand networking concepts and basic communication model.*
- *To understand network architectures and components required for data communication.*
- *To analyze the function and design strategy of physical, data link, network layer and transport layer*
- *To acquire basic knowledge of various application protocol for internet security issues and services.*

COURSE CONTENT

UNIT I

Principles of Data Communication, Data Communication Model & Tasks, Concept of Bandwidth & Channel Capacity, Nyquist's Law& Shannon's Law for Quantification of Capacity, Data Rate Versus Baud Rate, Sampling & its types, Nyquist Criterion for Sampling, Data Transmission Concepts, Characteristics of Signals: Digital Signals, Analog Signals (Amplitude, Frequency, Period, Wavelength, Signal to Noise Ratio).

UNIT II

Data Encoding: NRZ-L, NRZ-I Encoding, Multilevel Binary &Biphase Encoding Techniques & their implementations. ASK, FSK, PSK & QPSK. PCM: Sampling & Quantization & Modulation, Delta Modulation, Amplitude Modulation. Reliable Transmission of Data: Asynchronous & Synchronous Transmission, Multiplexing: Concepts & Types (FDM, Synchronous & Statistical TDM). Error Detection: Parity Based, CRC-Based, Checksum Based. Error Control & Recovery Techniques, Concept of ARQ Standard & its Versions.

UNIT III

Goals & Applications of Computer Network. OSI model. TCP/IP protocol suite. LAN: Ethernet & Token Ring. WAN: Concept, Characteristics, & Architecture: WAN subnet. Internetworking Concept & Architectural Model, Connection Oriented & Connectionless Approaches, Packet switching & Circuit switching. Concept of Autonomous Systems. Internet Layer Protocols: IP (Addressing: Classful& classless IP Addressing, IP Multicasting, Routing, Fragmentation & Reassembly).

UNIT IV

ICMP, ARP, RARP. Routing Protocols: Interior (OSPF), Exterior (BGP). Transport Layer Protocols: TCP & UDP. Socket API for Network Programming: Concept of Port & Sockets. Basic Server Architectures. TCP Server & Client. UDP Server & Client. Network Security: Principles of Security, Firewalls & their Components, Encryption Techniques & examples of Encryption Standard (DES, AES & RSA).

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Describe how to connect machines in a network.*
- *Describe data communication between machines at various locations.*
- *Familiarize with LAN connecting devices and Network Layer.*
- *Learn different Network Layer Protocols.*
- *Understand the concept of Domain Name System (DNS).*

Text Books:

1. Computer Networks ,A.S. Tanenbaum, Pearson Education
2. Data Communications & Networking ,Forouzan, Tata McGraw Hill Company

References:

1. Computer Network, S.S.Shinde, New Age International Publisher.
2. Data & Computer Communication , Shashi Banzal ,Firewall media
3. Data & Computer communication, William Stallings, Pearson

Course Title:	Artificial Intelligence	**Course Code:**	MCA-3T4-C
Semester:	3rd	**Paper Type:**	Core
Credits:	04	**Max Marks:**	100
Pre Requisite:	MCA-1T3-C, MCA-2E7-DCE	**Co-Requisite:**	MCA-3T1-C, MCA-3T2-C

Marks Distribution: (Mid Term:30, End Term:50, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To present an overview of artificial intelligence (AI) principles and approaches.*
- *To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.*
- *To have understating of different search problems and their solution using various algorithms.*
- *To have basic understanding of machine learning strategies and their role in Artificial Neural Networks*

COURSE CONTENT:

UNIT I

Introduction to Artificial Intelligence, Applications of Artificial Intelligence, and Intelligent agents: Agents and Environments, the nature of environments, structure of agents, Concept of Rationality. Introduction to First order logic, rules in FOL, Prepositional Logic.

UNIT II

Searching for solutions, uniformed search strategies. Search with partial information (Heuristic search) Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions.

Local search Algorithms: Hill climbing, local beam search.

Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning

UNIT III

Artificial Neural networks: Introduction to Artificial neural networks, analogy with biological neural network, McCullough-Pitts Model of a neuron, Single layer and Multilayer perceptron, sigmoid function, Training by back propagation, generalization, avoiding, over fitting. Introduction to Learning, concept of supervised, unsupervised and reinforcement learning.

UNIT IV

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in first order logic, Resolution, Unification, Forward & Backward chaining, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Design intelligent machines/systems which act rationally and take the right decision at the right time.*
- *Define an AI problem and find a solution for it.*
- *Represent Knowledge using various knowledge representation schemes.*
- *Understand the basic knowledge acquisition methods.*
- *Understand Artificial Neural Networks and its applications*

Text Books:

1. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.

References:

1. Introduction to Artificial Intelligence – Rajendra Akerkar, PHI.
2. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition
3. Artificial Intelligence and Expert Systems – Patterson PHI
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson

Course Title:	Advanced Operating System	**Course Code:**	MCA-3E1-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T4-C	**Co-Requisite:**	MCA-3T2-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To understand the basics of distributed systems.*
- *To understand the distributed communication using RPC*
- *To understand the various issue and challenges in during communication of distributed systems*

COURSE CONTENT:

UNIT I

Introduction to Distributed Systems: Motivation & Goals, Advantages & Disadvantages of Distributed Systems over Centralized Systems, Hardware & Software Concepts. Design Issues: Transparency, Flexibility, Performance, Scalability, Heterogeneity, Reliability and Security. Concept of Client-server Model

UNIT II

Remote Procedure Calling (RPC): Motivation, Mechanism, Complexity, Design Issues & Classification. Synchronization in Distributed Systems: Physical Clock Synchronization (Centralized & Distributed Algorithms), Logical Clocks. Mutual Exclusion: Centralized & Distributed (Contention & Token) Algorithms. Election Algorithms: Bully Algorithm, Invitation Algorithm & Ring Algorithm.

UNIT III

Deadlock Detection: Centralized & Distributed Algorithms. Threads: Characteristics, Advantages & Disadvantages, Design Issues & Usage. System Models: Workstation Model, Processor Pool Model & Hybrid Model. Processor Allocation: Goals & Design Issues. File systems: Hierarchical file systems, Distributed File system (DFS): goals, Requirements, Components, Service Types. SUN-NFS: Design & Issues.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Provide hardware and software issues in modern distributed systems.*
- *Get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.*
- *Analyze the current popular distributed systems such as peer-to-peer (P2P) systems*
- *Know about Shared Memory Techniques.*
- *Design and Implement Distributed applications using Technologies like RPC, threads.*
- *Learn how to store data in Distributed File System.*
- *Understand How Distributed Shared Memory is managed.*

Text Books:

1. A. S. Tanenbaum, "Distributed Operating systems", Pearson Education, 2008.

References:

1. Couloris et. al., "Distributed Systems: Concepts and Design", Pearson Education, 2005.
2. P. K. Sinha, "Distributed Operating Systems: Concepts & Design", PHI Learning, 2007.

Course Title:	Distributed Databases	**Course Code:**	MCA-3E2-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T2-C	**Co-Requisite:**	MCA-3T1-C, MCA-3T2-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies and showing the need for distributed database technology to tackle deficiencies of the centralized database systems.*
- *To expose active and emerging research issues in distributed database systems and application development.*

COURSE CONTENT:

UNIT I

Features of Distributed versus Centralized Databases – Why Distributed Databases – Distributed Database Management Systems (DDBMSs)- Review of Databases – Review of Computer Networks-Levels of Distribution Transparency- Reference Architecture for Distributed Databases – Types of Data Fragmentation – Distribution Transparency for read-only Applications – Distribution transparency for Update Applications – Distributed Database Access Primitives – Integrity Constraints in Distributed Databases - A Framework for Distributed Database Design – The Design of Database Fragmentation – The Allocation of Fragments.

UNIT II

Foundations of Distributed Concurrency Control – Distributed Deadlocks – Concurrency Control Based on Timestamps – Optimistic Methods for Distributed Concurrency Control - Reliability – Basic Concepts Non-blocking Commitment Protocols – Reliability and Concurrency Control – Determining a Consistent View of the Network – Detection and Resolution of Inconsistency – Checkpoints and Cold Restart - Distributed Database Administration – Catalog Management in Distributed Databases – Authorization and Protection.

UNIT III

Distributed object database management systems – Fundamental object concepts and Models – Object – Abstract Data Types – Composition (Aggregation) – Class – Collection – Subtyping and Inheritance. – Object Distribution Design – Horizontal Class Partitioning – Vertical Class Partitioning – Path Partitioning – Class Partitioning Algorithms – Allocation – Replication – Alternative Client / Server Architectures – Cache Consistency – Object Identifier Management – Pointer Switching Object Migration – Distributed Object Storage – Object Query Processor Architectures – Query Processing Issues – Query Execution – Correctness Criteria – Transaction Models and Object Structures – Transactions Management in Object DBMSs – Transactions as Objects – Conclusion – Bibliographic Notes – Exercises.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.*
- *Evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.*
- *Describe distributed concurrency control based on the distinguished copy techniques and the voting methods*
- *Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.*

Text Books:

1. M.Tamer Ozsu, Patrick Valduriez, Distributed database systems, 2nd Edition, Prentice Hall of India, New Delhi.
2. Distributed Databases:Principles and Systems by Stefano Ceri, McGrawHill

References:

1. Distributed Database Systems by Chhanda Ray, Pearson
2. Distributed Database Management Systems: A Practical Approach by by Frank S. Haug and Saeed K. Rahimi, Wiley
3. Distributed Database Systems by David A. Bell, Jane B. Grimson, and Jane Grimson, Addison-Wesley

Course Title:	Bioinformatics	**Course Code:**	MCA-3E3-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-1E3-DCE, MCA-2E7-DCE	**Co-Requisite:**	MCA-3T4-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.*
- *Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.*
- *Explain about the methods to characterize and manage the different types of Biological data.*
- *Classify different types of Biological Databases.*
- *Introduction to the basics of sequence alignment and analysis.*
- *Overview about biological macromolecular structures and structure prediction methods.*

COURSE CONTENT:

UNIT I

Introduction to biology, Living cell: characteristics & functions, basics of molecular biology: DNA, RNA, gene, genetic code, processes of transcription, translation, splicing etc. , basics of proteins, sequences, structure & functions of proteins, Introduction to bioinformatics: Definitions & concepts, & the role of bioinformatics, Types of biological data.

UNIT II

Introduction to databases, types of Biological Databases – flat file databases, relational databases, object-oriented databases, introduction to biological databases, Sequence databases (EMBL, GenBank, DDBJ, SWISS-PROT, PIR, TrEMBL), search engines: SRS, ENTREZ. BLAST, FASTA.

UNIT III

Basic overview of algorithms: Space & time complexity. Need & significance of sequence alignment. Global & local alignments, techniques of sequence alignments: Doplot, Needleman-wunsch algorithm for global alignment, Smith-waterman algorithm for local alignments, substitution matrices: PAM, Blosum etc. Gene prediction (ab initio & similarity based). Ontologies in bioinformatics: need for ontologies.

COURSE OUTCOMES:

At the end of the course student will be able to apply:

- *knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics*
- *Existing software effectively to extract information from large databases and to use this information in computer modeling*
- *Problem-solving skills, including the ability to develop new algorithms and analysis methods*
- *An understanding of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries*

Text Books:

1. T. K. Attwood & D J Parry-Smith, "Introduction to bioinformatics", Pearson Education
2. Jean-Michel Claveriw, CerdricNotredame, "Bioinformatics – A beginner's Guide", WILEY DreamTech India Pvt

References:

1. Harshawardhan P. Bal." Bioinformatics Principles & Applications" O'Reily
2. T. K. Attwood & D J Parry-Smith, "Introduction to bioinformatics", Pearson Education
3. Jean-Michel Claveriw, CerdricNotredame, "Bioinformatics – A beginner's Guide", WILEY DreamTech India Pvt
4. S.C. Rastogi, N. Mendiratta" Bioinformatics Methods &Applications"TMH
5. Krane ,"Bioinformatic", Pearson Education
6. B. Bergeron, "Bioinformatics Computing", Pearson
7. D. E. Krene& M.L. Payma, "Fundamental concepts of Bioinformatics", Pearson

Course Title: Soft Computing
Semester: 3rd
Credits: 03
Pre Requisite: MCA-2E7-DCE
Course Code: MCA-3E4-DCE
Paper Type: DCE
Max Marks: 75
Co-Requisite: MCA-3T4-C
Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.*
- *To implement soft computing-based solutions for real-world problems.*
- *To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.*

COURSE CONTENT:

UNIT I

Soft Computing & AI: Introduction & applications of soft computing, soft computing vs. hard computing, Artificial Intelligence: Introduction & application, Intelligent Agents, Structure of Intelligent Agents & types of agents.

UNIT II

Neural Networks & Fuzzy Logic: Neural networks: Characteristics, artificial neural net terminology, Model of a neuron, Topology, Learning, types of learning, Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions.

UNIT III

Support vector machines, Introduction to Evolutionary computation: Evolutionary algorithms- Genetic & differential evolution, Swarm intelligence, Population based meta heuristic methods,

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Identify and describe soft computing techniques and their roles in building intelligent machines*
- *Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems and to apply genetic algorithms to combinatorial optimization problems.*
- *Evaluate and compare solutions by various soft computing approaches for a given problem.*

Text Books:

1. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro: Fuzzy and Soft Computing, Prentice: Hall of India, 2003
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.

References:

1. Artificial Intelligence-A Modern Approach" – by Stuart Russell, Peter Norvig , Pearson Education
2. Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, S,Rajasekaranand G.A. VijayalakshmiPai, PHI Publication.
3. Introduction to artificial neural systems - by J.M. Zurada.(Jaico Pub)
4. Artificial Intelligence, Rich E & Knight K, TMH, New Delhi.
5. Neural Network fundamental with Graph , Algo.andAppl, by Bose, TMH
6. Neural Network & Fuzzy System, by Kosko PHI Publication
7. Neural Networks & Fuzzy Logic - by Bart Kosko
8. Neural computing theory & practice - by P.D. wasserman (ANZA PUB).
9. Principles of Soft Computing, S.N. Sivanandamand S.N. Deepa, Wiley Publications
10. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.

Course Title:	System Software Design	**Course Code:**	MCA-3E5-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T1-C, MCA-2E3-DCE	**Co-Requisite:**	MCA-3T1-C, MCA-3E1-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVE:

The objective of this course is to teach procedures for the design of software systems and to provide a basis for judgement in the design of system software. The focus is to discuss the design and implementation of the major system software components with the consideration of underlining the pertinent design issues. The design issues are likely to be discussed in the context of modern computer systems that include the different languages and advanced operating systems.

COURSE CONTENT:

UNIT I

Overview, Introduction to Machine Structure, Evolution of the System Programming Components: Assemblers, Loaders, Macros, Linkers, Compilers.
Evolution of Operating System & User View: Functions, Batch Control Language & Facilities.
Machine Structure 360-370: Memory, Registers, Data, Instructions & Special Features.
Machine Language & Assembly Language.

UNIT II

Assemblers: General Design Procedure: Problem Statement, Data Structures, Format of Databases, Algorithms, Modularity Lookup. Table Processing: Review of Searching & Sorting Techniques. Macros: Macro Instructions, Features, Conditional Macro Instructions, Macro Calls within Macros, Single & Two Pass Algorithm, Implementation of Macro Calls within Macros. Implementation within an Assembler

UNIT III

Loaders: Schemes: Compile & Go Loaders, General Loader Scheme, Absolute Loaders, Subroutine Linkages, Relocating Loaders. Other Loader Schemes & Binders: Linking Loaders, Overlays & Dynamic Binders. Design of an Absolute Loader, Design of a Direct Linking Loader. Programming Languages & Formal Systems: Significance of High Level Languages, Features. Data Types & Data Structures, Storage Allocation & Scope of Names, Accessing Flexibility, Functional Modularity, Use of Formal Systems, Formal Specification, Formal Grammars, Hierarchy of Languages, Backus Normal Form – BNF, Canonic Systems & Formal Systems.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Basic Understanding of Machine Structure and its Major System Software Components*
- *Comprehend Assembler Design Issues and Procedures*
- *Understand Macros and Macro Challenges*
- *Understand various Loader Schemes with the consideration of underlining the pertinent design issues*
- *Understand Compilers in the context of different languages and advanced operating systems.*

Text Books:

1. John J. Donovan, "Systems Programming",Tata McGraw-Hill

References:

1. Barron.D.W. "Assemblers & Loaders", Mc Donald & Javes
2. Ullman.J.D."Fundamentals of Programming System" Addison & Wesley.
3. M.Dhamdhere."System Programming & Operating Systems"

Course Title:	Natural Language Processing	**Course Code:**	MCA-3E6-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2E7-DCE	**Co-Requisite:**	MCA-3T4-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To understand natural language processing and to learn how to apply basic algorithms in this field.*
- *To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language data - corpora.*
- *To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.*

COURSE CONTENT:

UNIT I

The study of Language, challenges of NLP, The Different Levels of Language Analysis, Representations & Understanding, Linguistic background, Grammars & Parsing, Features & Augmented Grammars, Grammars for Natural Language, Towards Efficient Parsing, Ambiguity Resolution. Applications in Information Retrieval, design features of information retrieval system, Language Modelling: Grammer based model & statistical model.

UNIT II

Word Level & Syntactic Ananlysis: Spelling error detection & correction, parts of speech tagging Morphological parsing, Probabilistic parsing .Semantic Interpretation: Semantics & Logical Form, Linking Syntax & Semantics, Strategies for Semantic Interpretation. Pragmatics: Reference Resolution, Syntactic & Semantic Coherence, Text Coherence, An Inference based resolution algorithm.

UNIT III

Natural language Generation: Introduction to language generation, architecture for generation, surface realization, systemic grammar, functional unification grammar, discourse planning Machine Translation: problems in machine translation, Language Similarities & Differences, transfer metaphor, syntactic transformations, lexical transfer, idea of Interlingua, direct translation, using statistical Techniques.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *The students will get acquainted with natural language processing and learn how to apply basic algorithms in this field.*
- *They will understand the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language processing.*
- *They will also grasp basics of knowledge representation, inference, and relations to the artificial intelligence.*

Text Books:

1. James Allen, "Natural Language Understanding", Pearson Publication, ISBN: 978-81-317-08958 2nd Edition

References:

1. D. Jurafsky, J. H. Martin, "Speech & Language Processing", Pearson Education, 2002.
2. Speech & Language Processing, by Jurafsky, D. & Martin,
3. J.H.Tanveer Siddiqui, US Tiwary, Natural Language Processing & Information Retrieval

Course Title:	Digital Image Processing	**Course Code:**	MCA-3E7-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2E7-DCE	**Co-Requisite:**	MCA-3T4-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To study image fundamental and mathematical transforms necessary for image processing.*
- *To study fundamental technologies for digital image, compression, analysis, and processing*
- *To Gain understanding of algorithm, analytical tools, and practical implementations of various digital image applications*

COURSE CONTENT:

UNIT I

Introduction & Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Representation, Image Sampling & Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear & Non Linear Operations. Image Enhancement in the Spatial Domain: Some basic Gray Level transformations, Histogram Processing, Enhancement Using Arithmetic & Logic operations, Basics of Spatial Filters, Smoothening & Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

UNIT II

Image Enhancement in the Frequency Domain: Introduction to Fourier Transform & the frequency Domain, Smoothing & Sharpening Frequency Domain Filters, Homomorphism Filtering. Image Restoration: A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Dedradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

UNIT III

Image Compression: Coding, Interpixel & Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. Image Segmentation: Detection of Discontinuities, Edge linking & boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Understand Basics of Image formation and transformation using sampling and quantization.*
- *Perform and apply compression and coding techniques used for image data.*

Text Books:

1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", Pearson Education

References:

1. A.K. Jain, "Fundamental of Digital Image Processing", PHI
2. Bernd Jahne, "Digital Image Processing", Springer
3. William K Pratt, "Digital Image Processing: Piks Inside", John Wiley & Sons

Course Title:	Linux System Programming	**Course Code:**	MCA-3E8-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-1T1-C, MCA-2T4-C	**Co-Requisite:**	MCA-3T2-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVE:

The objective of course Linux System Programming is to help users in development process and thus maximize the programming time and applications use of Linux system and encourages and enable the users to develop their own real-world applications.

COURSE CONTENT:

UNIT I

Introduction Linux, History of Linux, Linux Architecture & features, Linux and Unix. Introduction to Linux file System. File operations, Mounting and Unmounting of file systems, Different files types (Ext2 & Ext3). Files & Directory Structure. Overview of Linux process management, process states. Linux Editors and Compilers, Overview of YACC and LEX.

UNIT II

Introduction to Shell programming: Command line programming, Shell types (Bourne Shell, Korn Shell, C shell),Shell Script and structure, Running a Shell Script, Introduction to Linux programming, declaring Variables, input and output operations, Using break, continue, exit, return & Special Parameters ($* and $@) Operators, Conditional Constructs IF-Then-FI,IF-THEN-ELIF-FI, Looping Constructs: for-in, while, untill , Built-in Mathematical Functions,

UNIT III

Filters and Shell Command: Pr, Head, tail, cut, paste, sort, uniq, tr, join etc. grep, egrep, fgrep, sed, awk etc. File permission commands, File and directory command. Pipeline & Input/output redirection and commands, Introduction to system calls, creat, open, close, read etc. background and foreground process managing commands. Linux GUI Development: Introduction to Qt as GUI development tool, Managing Controls and forms in

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Use basic fundamental utilities which are required again and again on daily basis to work on a modern operating system.*
- *Write useful shell scripts which greatly and effectively enhance the usefulness of computers, from the point of view of programmers and application developers.*
- *Understand basics of various OS related concepts, from programmer's point of view, like files, directories, kernel, inodes, APIs, system calls, processes, signals, etc.*
- *Develop applications where several processes need to communicate with each other to complete a task.*
- *Use different IPC ways in their programs like Message Queues, Semaphores, and Shared Memories.*
- *Write programs which employs advanced concepts like multithreading.*
- *Write useful programs for networking purposes*

Text Books:

1. A practical guide to Linux commands, Editors and Shell Programming by Mark G.Sobell.
2. System Programming n Linux/Unix by K.C Wang publisher:Springer International
3. Understanding the Linux Kernal Publisher O'Relly Media.

References:

1. Linux System Programming Talking Directly to the Kernel & C Library By Robert LovePublisher: O'Reilly Media Final Release Date: September 2007 Pages: 392
2. Advanced Programming in Unix Environment Second Edition W.Richard Steven Stephen A Rago Publisher Addison Wesley

Course Title:	Data Warehouse	**Course Code:**	MCA-3E9-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T2-C	**Co-Requisite:**	MCA-3E2-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To provide students with an understanding of the fundamentals of data warehouse, its basic components and the role of data warehouse in decision support.*
- *To provide knowledge of the important steps and techniques to be considered during data warehouse development, future trends and usage of data warehouse.*
- *To introduce the concept of dimensional modelling technique for designing a data warehouse.*
- *To provide knowledge of data integration and the extraction, transformation and load (ETL) processes.*
- *To introduce students to the methods and tools for accessing and analyzing the warehouse data.*

COURSE CONTENT:

UNIT I

Overview of decision support systems: Organizational need for strategic information, Failures of past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined. Data warehouse – The building Blocks: Defining Features, data warehouses & data marts, overview of the components, metadata in the data warehouse

Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope & content

UNIT II

Principles of dimensional modeling: Objectives, From Requirements to data design, the STAR schema, STAR Schema Keys, Advantages of the STAR Schema

Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables.

UNIT III

Data Extraction, Transformation and Loading: Objectives, ETL Overview, ETL Requirements and Steps, Data Extraction- Source Identification, Data Extraction Techniques, Evaluation of Techniques, Data Transformation- Major Transformation Types, Data Integration and Consolidation, Transformation for Dimension Attributes, Transformation Implementation, Data Loading, ETL Tool Options, Other Integration Approaches.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Understand the concept related to data warehouse architecture*
- *Compare Online Analytical Processing (OLAP) and Online Analytical Transaction Processing(OLTP) tools*
- *Design a data mart or data warehouse for any organization*
- *Asses raw input data and preprocess it to provide suitable input for range of data mining algorithms*
- *Extract association rules and classification model*
- *Identify the similar objects using clustering techniques*

Text Books:

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons

References:

1. Sam Anahony, "Data Warehousing in the real world: A practical guide for building decision support systems", John Wiley
2. Alex Berson,Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill W. H. 5.
3. Inmon, "Building the operational data store", John Wiley
4. Kamber & Han, "Data Mining Concepts & Techniques", Hartcourt India P. Ltd.

Course Title:	Open Source Technologies	**Course Code:**	MCA-3E10-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-1E4-DCE, MCA-2E7-DCE	**Co-Requisite:**	MCA-3T2-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To learn about Linux Administration.*
- *To learn PHP and its database connectivity.*
- *To learn how to create Websites with PHP MY-SQL.*
- *To learn Content Management System. And Introduction to No-Sql.*

COURSE CONTENT:

UNIT I

Introduction to Linux – Architecture, Installation, Configuration, Package Management, Basic Linux commands - file system commands, vim. Apache Http Server – installation, basic configuration, setting up virtual hosts, installation of modules, etc

UNIT II

Introduction to PHP - variables, data types, basic constructs, loops, functions, classes. Installation of third party php modules. Introduction to MySQL database. PHP-MySQL connectivity. Introduction to HTTP – HTTP methods, headers, cookies, etc. Creating a basic website with PHP & MySQL.

UNIT III

Content management system based on php & mysql e.g. Wordpress & Drupal – installation, configuration. Introduction to NoSQL – installation & configuration of Mongodb. Basic select, insert, update & delete operations, aggregate operations. Backup & restoration.

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Explore different open source technology like Linux, PHP & MySQL with different packages.*
- *Execute Linux commands for programming.*
- *Execute programs of PHP with MySQL connection*

Text Books:

1. Core Java Volume 1-Fundamentals by Cay S.horstman 10th edition Publisher: Prentice Hall

References:

1. Java the complete reference by Herbert Schield 10th edition Publisher:Tata Mc Graw Hill
2. Java How to program Dietel and Dietel

Course Title:	Introduction to Python	**Course Code:**	MCA-3E11-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T1-C, MCA-2E7-DCE	**Co-Requisite:**	MCA-3T1-C, MCA-3T4-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To learn the essential concepts of Python programming*
- *The course aims at equipping participants to be able to use python programming for solving data science problems.*
- *To understand the advantage of using Python libraries for implementing Machine Learning models*
- *To perform data visualization, web scraping, and natural language processing.*

COURSE CONTENT:

UNIT I

Basics of Python: Introduction to Python, Why learn Python, Keywords and identifiers, comments, indentation and statements, Variables and data types in Python, Operators, Standard Input and Output, Introduction to IDE such as Sublime, pycharm, spyder and relevant packages installations such anaconda.

Control structure and function: if-elif-else, while loop, for loop, break and continue, Introduction to function, Types of functions, Function arguments, Lambda functions, File Handling, packages and modules.

UNIT II

Python Data Structures: Lists, Tuples, Dictionary, Sets, strings, Numpy: Numpy operation, Array and its operation, Matrix and associated operations, Linear algebra and related operations using python. Understand the advantage of using Python libraries for implementing Machine Learning models. Types of data sets.

UNIT III

Pandas data frame and data frame related operations on dataset: Reading data files, pandas data frames, exploratory data analysis, Data preparation and preprocessing (Dealing with missing value, cross-validation, classification, performance measure),

Data visualization on dataset using matplotlib and seaborn libraries: Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

Introduction to Regression - Linear, Non-linear, Simple and Multiple regression, and their applications, Introduction to Classification technique - KNN, ANN, Decision Trees and SVM

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Read, write, and execute simple Python programs.*
- *Write simple Python programs for solving problems.*
- *Decompose a Python program into functions, lists etc.*
- *Read and write data from/to files in Python Programs*
- *Underline the use of package*

Text Books:

1. Mastering Python for data science, Samir Madhavan
2. Introduction to Machine Learning with Python, Andreas C. Mueller

References:

1. Machine Learning using Python, U Dinesh Kumar Manaranjan Pradhan
2. McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython.

Course Title:	Dot Net	**Course Code:**	MCA-3E12-DCE
Semester:	3rd	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-2T2-C, MCA-2E7-DCE	**Co-Requisite:**	MCA-3T2-C, MCA-3E10-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *Understand the fundamentals of developing software applications using object oriented methodologies*
- *Creating C# Net applications using standard .net controls.*
- *Connecting to different data sources and querying the database.*
- *To understand the basic of ASP. Net web application.*

COURSE CONTENT:

UNIT I

An Overview of .NET Technology: Features of .NET, Understanding .NET Framework, Main Components of .NET Framework, The Common Language Runtime, The Common Language Specification, The Common Type System, .NET Class Libraries, Assemblies, Metadata and Attributes. Introduction to Visual Studio.NET: Exploring Visual Studio.NET Interface.
C# Variables and Data Types, Program Flow Control in C#, Arrays, Using statement, Namespace , Aliases , The Main() Method, Passing Arguments to main() . Console I/O, Using Comments, Operators and Casts, Error and Exception Handling. C# IDE,

UNIT II

Basic Window Controls: Text Box, Label, Check Box, List Box, Checked List Box, Radio Buttons, Buttons, Tree View and List View Controls.
Objects and Type: Classes and Structs, Partial classes, static classes, Function Overloading, Operator Overloading, Inheritance: Types of inheritance, virtual methods, hiding methods, sealed classes and methods, Interfaces, Derived interfaces. Type safety, Type conversions, boxing and unboxing, comparing objects for equality, type casting, Delegates and Events, Strings, Collections, Array Lists.

UNIT III

Introducing Web Application, Components of Web Application, Building a Web Form, HTML Server Controls. ASP.NET, Using Visual Web Developer, Designing a Simple Web Form. Including C# Code in ASP.NET, Hosting the Web Page, IIS Web Server

An Overview of ADO.NET, Design Goals of ADO.NET, ADO.NET Architecture, Objects Used in ADO.NET Model, .NET Framework Data Providers, .NET Framework Data Provider for SQL Server, Provider for Oracle, ADO.NET Data Set Object Model, Data Binding, Types of Data Binding, Generating Data Set, Binding Controls to the Data Set

COURSE OUTCOMES:

At the end of the course student will be able to:

- *Understand the Microsoft .NET Framework and ASP.NET page structure*
- *Design web application with variety of controls*
- *Access the data using inbuilt data access tools*
- *Use Microsoft ADO.NET to access data in web Application*
- *Configure and deploy Web Application*
- *Develop secured web application*

Text Books:

1. "ASP .Net : Unleashed" , SAMS Publications'
2. Dietel &Dietel , "C# , How to Program",Pearson Education.

References:

1. "ASP .Net for beginner",Wrox Publications
2. Visual C#.Net by John Sharp & John Jagger, PHI, New Delhi.
3. 14 lesson to get you started with c# and dot net, faraz rasheed