Scheme of Examination for
Master of Computer Applications (MCA)
Two-Year Programme under CBCS Scheme
w.e.f. Academic Session 2020-2021

MCA SEMESTER-I

Course No.	Course Title	Credit	Int.	Ext.	Total
MCA-11	Computer Architecture and Parallel Processing	4	30	70	100
MCA-12	Computer Networks	4	30	70	100
MCA-13	Software Engineering	4	30	70	100
MCA-14	Operating Systems	4	30	70	100
MCA-15	Java and [dot]NET	4	30	70	100
MCA-16	Software Lab – Java	2	-	50	50
MCA-17	Software Lab – [dot]NET	2	-	50	50
Total		**24**	**150**	**450**	**600**

MCA SEMESTER –II

Course No.	Course Title	Credit	Int.	Ext.	Total
MCA-21	Data Structures	4	30	70	100
MCA-22	Computer Graphics	4	30	70	100
MCA-23	Database Systems	4	30	70	100
MCA-24	Artificial Intelligence	4	30	70	100
MCA-25	J2EE and ASP[dot]NET	4	30	70	100
MCA-26	Software Lab- J2EE	2	-	50	50
MCA-27	Software Lab – ASP[dot]NET	2	-	50	50
Total		**24**	**150**	**450**	**600**

Note: Every MCA student shall attend a 6-8 weeks' industry-based Internship/Summer Training after 2nd semester examination/during summer vacations. A report shall be submitted to the Department by every student at the completion of the internship. Presentation/viva voce examination of the internship/summer training will be held during 3rd semester of MCA programme. Internship/summer training will carry a weight of 4 credit.

MCA SEMESTER-III

Course No.	Course Title	Credit	Int.	Ext.	Total
MCA-31	Web Development	4	30	70	100
MCA-32	IoT and Cloud Computing	4	30	70	100
MCA-33	Elective – I	4	30	70	100
MCA-34	Elective – II	4	30	70	100
MCA-35	Elective – III	4	30	70	100
MCA-36	Software Lab - Web Development	2	-	50	50
MCA-37	Software Lab - Linux/Android	2	-	50	50
MCA-38	Presentation/Viva on Internship	4	-	100	100
Total		**28**	**150**	**550**	**700**

MCA – 33 Elective – I Courses' List

(i) Linux and Shell Script
(ii) Android Software Development

MCA – 34 Elective –II Courses' List

(i) Network Security
(ii) Wireless Networks

MCA – 35 Elective – III Courses' List

(i) Discrete Mathematics
(ii) Theory of Computations
(iii) Compiler Construction

MCA SEMESTER-IV

Course No.	Course Title	Credit	Int.	Ext.	Total
MCA-41	Python Programming	4	30	70	100
MCA-42	R Programming	4	30	70	100
MCA-43	Elective – IV	4	30	70	100
MCA-44	Elective – V	4	30	70	100
MCA-45	Project Work	8	50	150	200
MCA-46	Software Lab –Python Lab	2	-	50	50
MCA-47	Software Lab –R Prog. Lab	2	-	50	50
Total		**28**	**170**	**530**	**700**

MCA – 43 Elective – IV Courses' List

(i) Soft Computing
(ii) Machine Learning
(iii) Genetic Algorithms

MCA – 44 Elective –V Courses' List

(i) Data Warehousing and Data Mining
(ii) Big Data Analytics
(iii) Data Science

Total Programme Credits
MCA 2–Year under CBCS
w.e.f. Academic Session 2020-2021

Semester	Max. Marks	Credits
I	600	24
II	600	24
III	700	28
IV	700	28
Sub-total	**2600**	**104**
Open Elective Courses	300	12
Programme Total	**2900**	**116**

MCA 11- Computer Architecture and Parallel Processing

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: Total 09 questions are to be set by the examiner. First question will be compulsory consisting of 5 short answer type questions (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives: The objective of this course aims that the students know and strengthen key aspects of analysis, design and implementation of classic sequential architectures ,the immediate improvements within this classic paradigm, and the existence of alternatives architectures.

Learning Outcomes: The student will be able to identify, understand and apply different number systems and codes. Understand the digital representation of data in a computer system, general concepts in digital logic design, including logic elements and their use in combinational and sequential logic circuit design

Unit I

Boolean Algebra and Logic Gates: Basic Definitions, Boolean Functions, Digital Logic Gates, Simplification of Boolean Functions- Canonical and Standard form, K-Map Method, Prime Implicants, Information Representation -Fixed and Floating Point Representation, Number System and Codes. Binary Arithmetic Operations, Error detecting and correcting codes

Unit II

Design of Combinational and Sequential Circuit: Adders and Subtractors, Multiplexer and Demultiplexer, Encoder and Decoder, Comparators

Sequential Circuit: Flip-Flops, Counters and Registers

Unit III

Basic Computer Organisation: Relation between Computer organisation and Computer architecture, Instruction Codes, Instruction Format, Machine Instructions, Instruction Cycle, Addressing Modes, Flow Chart of Instruction Cycle, Interrupts and Types of Interrupts, Interrupts Cycle, Register Transfer and Micro operations.

Unit IV

Concepts related to Architecture and Parallel Processing: Memory Hierarchy, Basic of Pipelining, Parallel computers- Flynn's Classification, Memory –Interleaving, Data Transfer between CPU, Memory and I/O devices, I/O processor, Direct Memory Access (DMA), Microprogramming Concepts, Hardwired and Micro Programmed Control unit, RISC/CISC.

References:

1. "Computer System Architecture" M. Morris Mano
2. "Digital Logic and Computer Design" by M. Morris Mano

3. "Computer Architecture and Parallel Processing" by Kai Hwang
4. "Parallel Computers – Architecture and Programming" by Rajaraman V

MCA-12 Computer Networks

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Objective of this course is to make the students familiar with the basic concepts of Networking. It will also make the students familiar with the working of latest network technologies and applications.

Learning Outcomes:

After getting though this course student will gain the knowledge of Networking models, different media for transmission, addressing types and their difference, routing protocols. Students will also gain knowledge of layered structure and working of different network technologies used in today's world.

Unit-I

Network Concepts : Goals and applications of computer Networks; Topologies; Categories of Networks - LAN, MAN, WAN Internet works; point-to point, and broadcast networks.

Networks architecture: Concepts of protocols & services; OSI model and functions of its layers; TCP/IP reference model. TCP/IP: Elements of Transport Protocols; Transmission Control Protocol (TCP); user datagram protocol (UDP); Internet Protocol (IP).

Unit-II

Data communication concepts: Components of a data communication system; transmission modes; transmission media – guided and wireless media; introduction to switching (circuit, message and

packet) and multiplexing (frequency division and time division); concept of Modems. Introduction to SMDS, X:25, Networks ISDN, frame relay and ATM networks.

Unit III

Framing and Error control: Framing techniques; Error control-error detection & correction.

Data Link Control: Acknowledgments, sliding Window protocols. Multiple Access Control, Flow and Error Control, , token bus, token ring, DQDB

Unit-IV

Routing: Deterministic and Adaptive routing; Centralized and distributed routing; shortest-path; flooding; flow based; optimal; distance vector, link-state, hierarchical; routing for mobile hosts; broadcast and multicast routing.

Congestion Control: Principles of congestion control; Traffic Shaping; Choke packets; load shading; RSVP.

References:

1. Andrews, Tananbaum, Computer Networks – PHI.
2. Fred Halsall, Addison Wesley, Data Communications, Computer Networks and Open Systems, fourth edition.
3. Behrouz, Frozen, Introduction to Data Communications and Networking- Tata McGraw Hill.
4. William Stalling, Data and Computer Communications, 5th edition-, PHI.

MCA-13 Software Engineering

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To study fundamental concepts in software engineering, SDLC, Software requirements specification, formal requirements specification and verification.
- To study the basic techniques for improving quality of software.
- Understand the fundamental principles of Software Project management & will also have a good knowledge of responsibilities of project manager and how to handle these.
- To understand the basic knowledge of Estimation model.

Learning Outcomes:

- Ability to analyze and specify software requirements.
- Ability to apply software engineering principles and techniques to develop large-scale software systems.
- Ability to plan and work effectively in a team.

Unit-I

Software and software engineering, Software characteristics, software crisis, software engineering paradigms, Planning and software project, Software cost estimation , project scheduling, personnel planning, team structure.

Unit-II

Software configuration management, quality assurance, project monitoring, risk management.

Software requirement analysis - structured analysis, object oriented analysis and data modeling, software requirement specification, validation.

Unit-III

Design and implementation of software - software design fundamentals, Structured design methodology and Object Oriented design, design verification, monitoring and control, coding.

Software Reliability - metric and specification, fault avoidance and tolerance, exception handling, defensive programming.

Unit-IV

Testing - Testing fundamentals, white box and black box testing, software testing strategies: unit testing, integration testing, validation testing, system testing, debugging.

Software maintenance - maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools.

References:

1. Fundamentals of Software Engineering, Rajib Mall.
2. Software Engineering, a book by Aggarwal K.K, Singh Yogesh, New Age International
3. Pressman S. Roger, Software Engineering, Tata McGraw-Hill.
4. Jalote Pankaj, An integrated Approach to software, Engineering, Narosa Publishing House.

MCA-14 Operating Systems

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Some basic concepts of operating systems will be covered in this course. The objective of this course is to study, learn, and understand the basic concepts of operating systems, namely, types of operating systems, memory management, process management, deadlock management and file protection, etc.

Learning Outcomes:

From viewpoints of knowledge and understanding, a learner shall be able to appreciate the working of a computer system in general. Cognitively, the learners shall be able to understand the management of computing resources namely, processor/processes, primary and secondary storage, etc.

Unit-I

Introductory concepts: Operating system goals and functions, types of operating systems – batch operating system, multitasking operating system, time-sharing operating systems, real-time operating systems, distributed operating systems, system calls and their types, layered architecture of operating system; modules of kernel of operating system their functions.

Unit-II

Memory management: Functions of memory management module, memory allocation methods – contiguous and non-contiguous memory allocation; real and virtual memory allocation; fragmentation – internal and external, paging, segmentation, virtual memory concepts, demand paging, page replacement algorithms, thrashing, Belady's anomaly.

Unit-III

Process management: Process concept, PCB, Process switch and mode switch; system state and state space, state transition diagram; scheduling criteria, preemptive and non-preemptive scheduling, starvation and its mitigation, process scheduling algorithms, levels of scheduling, comparison of scheduling algorithms, inter-process communication, critical code section, mutual exclusion and its implementation, semaphore, hardware support for mutual exclusion.

Unit-IV

Deadlock - concept, conditions; deadlock management – prevention, avoidance, deadlock detection and recovery, practical considerations – ostrich approach; file – concept, file protection, file access control, file access methods; directory structure; disk space allocation; disk scheduling algorithms and their performance comparison.

References:

1. Peterson, J.L. & Silberschatz, A, Operating System concept, Addison Wesley Reading.
2. Brinsh, Hansen, Operating System Principles, Prentice Hall of Indio a.
3. Hageman, A.N., Introducing to Operation System Design Galgotia Publication, New Delhi.
4. Tanenbaum, A.S., Operating system.
5. Hansen P.B., Architecture Concurrent Programs, PHI.
6. Shaw, A.C., Logic design of Operating Systems, PHI.
7. Deitel, H.M., Operating System, John Wiley/Addison Wesley.

MCA-15 Java and [dot]NET

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Notes: - Total 09 questions are to bet set by the examiner. First question will be compulsory consisting of 5 short answer type question (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives:

- Illustrate the basic concepts and building blocks of Java and C#.Net language programming using module's approach which gives emphasize to small programs.
- Learn how to write moderately complex programs efficiently.
- Learn making GUI based application in Java as well as C#.Net.

Course Outcomes:

- Knowing essential concepts, principles and theories of Java and C# technology relating the Desktop application.

- Develop real world programming problems and applications efficiently using advanced libraries of both technologies.

Unit I

Introduction to Java and [dot]Net. Environments, Languages, Basic Concepts, Data Types, Scaler Data Types, Reference Types, Operators and its types, Decision Controls, Control Statements, Loops, Array, String, Functions. Boxing Unboxing. Scope of variables.

Unit II

Introduction to OOPS: Encapsulation, Class, Object, Constructors, Destructors, Polymorphism: Function Overloading and Operator Overloading, Inheritance, Interface, Abstract Class, Packages. Wrapper Classes. Exception Handling.

Unit III

Introduction to Multithreading: Thread Model, Multithreading Supporting classes and methods. Creating Single and Multiple Thread. Context Switching, Thread Synchronization. Interthread Communication. Dead Lock. Working with GUI: AWT.

Unit IV

Event Handling. Collection framework: Interfaces and Classes for collection. List, Set, Map. Date and Time. i18n. File Stream: Input and output Stream. File handling operations.

References:

1. Dongles E.Comet, Compiler Networks & Internet , 2nd edition, Addison Wesley.
2. Darrel Ince & Adam Freeman, Programming the Internet with Java, revised edition-, Addison Wesley.
3. E.Balaguruswamy, Programming with Java –2nd Edition, TNH
4. Herbert Schildt, The complete reference Java 2
5. Mug Hal K.A., Rasmussen R.W., Addison Wesley, A Programmer's guide to Java certification
6. E.Balaguruswami , Programming with Java, Tata MacGraw Hill.
7. Herbert Schildt, The complete reference Java, Tata MacGraw Hill.
8. K.A. Mug Hal, R.W. Rasmussen, Programmer's guide to Java certification, Addison Wesley.
9. E. Balaguruswamy, Programming in C #, Tata McGraw Hill.
10. Herbert Schildt, C #: A Beginner's Guide, Tata McGraw Hill.

MCA-21 Data Structures

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: Total 09 questions are to be set by the examiner. First question will be compulsory consisting of 5 short answer type questions (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives:

- To provide the knowledge of basic Data structures and their implementation.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Learning Outcomes:

Students will be able to:

- Select appropriate data structures to specified problem definition.
- Implement operations like searching, sorting, insertion, deletion and traversing on various data structures.

- Determine and analyze the complexity of given Algorithms.

Unit I

Data Structure and algorithm preliminaries: Definitions, Time and Space analysis of Algorithms, Time-Space Tradeoff, Mathematical Notation and functions, Asymptotic Notations for complexity of algorithms, Recursion, Divide and Conquer Strategy

Unit II

Linear Data Structures: Abstract Data Types, Array based implementation, Stack -Operations and application of Stacks, Queues- Operation on Queues, Circular queue, Priority queues and deQueue, Linked list and its variations, Implementation of Linked list, Header linked list for Polynomial manipulation.

Unit III

Non-linear Data Structures : Trees –Binary tree ,Tree Traversals, Binary Search Tree, Threaded Binary Tree ,AVL Trees, B-Tree, B+ tree , Heap and its applications, Huffman coding.

Graph- Representation of Graphs, Types of Graph, Graph Traversals, Topological Sort, Minimum Spanning trees , Kruskal and Prim's Algorithm, Application of Graphs.

Unit IV

Searching, Sorting and Hashing Techniques: Searching –Linear Search, Binary Search. Sorting- Bubble sort, Selection sort, Insertion sort, Radix sort, Shell sort, Merge Sort ,Quick Sort, Heap sort , Hashing- Hash functions, open addressing ,chaining, Rehashing.

References:

1. Seymour Lipschutz, Data Structures, McGraw-Hill Book Company, Schaum's Outline series, NewYork (1986).
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 2002.
3. Tanenbaum A.M., Langsam Y, Augenstien M.J., Data Structures using C & C++, Prentice Hall of India, 2002.
4. Data structures, Algorithms and Applications in C++, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

MCA-22 Computer Graphics

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: - Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

Objective of this course is to make the students familiar with the basic concepts of Computer Graphics. It will also make the students familiar with the working various graphic devices and applications.

Learning Outcomes:

After getting though this course student will gain the knowledge of graphic devices, different algorithms used in computer graphics. Students will also gain knowledge of various graphic operations.

Unit-I

Introduction: Survey of computer Graphics and its applications; Interactive and passive graphics; Introduction to GKS Primitives; display processors;

Graphic Devices: Display system-refresh CRTs, raster scan and random scan monitors Grey shades, Interlacing, beam penetration shadow mask monitors, lock up tables, plasma panel, LED and LCD Monitors, LCD Monitors, VGA and SVGA resolution; Hard copy Devices-printers, plotters

Unit-II

Drawing Geometry: Coordinate system; resolution; use of homogeneous coordinate system; scan conversion: symmetrical DDA, simple DDA, Bresenhams line drawing algorithm, generation of ellipse.

2-D Transformations: Translation; rotation; scaling; mirror reflection; shearing: Zooming; panning; input techniques-pointing, positioning, rubber and methods and dragging; tweezing.

Unit-III

Graphic operations: Clipping-line clipping using Sutherland-Cohen and midpoint: sub-division algorithm, polygon clipping; window and view port; windowing transformation; Filling-stack based fill algorithm

Multimedia: concepts of Hypertext/Hypermedia; multimedia applications; multimedia authoring; multimedia hardware; images; bitmaps; windows paint brush.

Unit-IV

3-D Graphics: 3D modeling of objects; 3D display techniques; coordinate system; 3D transformation matrices for translation, scaling and rotation; parallel projection; perspective projection; Hidden-surface removal – z- buffer, back face, scan-line, depth-sorting, area subdivision; shading- modeling light intensities, gourad shading, phong shading.

References:

1. Donald Hearn, Computer Graphics, M.Pauline Baker, PHI.
2. Newman & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
3. John F. Koegel Bufore, Multimedia systems, Addison Wesley.
4. Foley, Computer Graphics Principles & Practice, Addison Wesley.
5. Rogers, Procedural elements of Computer Graphics, McGraw Hill.
6. D.P. Mukherjee, Fundamentals of computer Graphics and Multimedia, PHI.

MCA-23 Database Systems

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note: Total 09 questions are to be set by the examiner. First question will be compulsory consisting of 5 short answer type questions (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives: The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve information from a database efficiently and effectively. This syllabus covers issues arising related to transaction processing in multiuser database systems.

Learning Outcomes:

Upon successful completion of this course, students should be able to:

- Describe the fundamental elements of RDBMS.
- Differentiate between Legacy data models and high-level data models.
- Improve the database design by Normalization.
- Formulate SQL queries on data

Unit-I

Basic Concepts: A Historical perspective, File System vs. DBMS, Characteristics of the Data Base Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of a DBMS, Implication of Data Base approach. **Database System concepts and Architecture-** Data Models, Schemas and Instances, DBMS architecture and Data Independence Data Base languages & Interfaces, DBMS functions and component modules.

Unit-II

Entity-Relationship Model: Entity Types, Entity Sets, Attributes & Keys, Relationships, Relationship Types, Roles and Structural Constraints, Design issues, Weak entity types, E-R Diagrams, Design of an E-R Data Base Schema, **Conventional Data Models**- An overview of Network and Hierarchical Data Models**, Relational Data Model-** Relational Model concepts, Integrity constraints over Relations, Relational Algebra – Basic operations.

Unit-III

SQL: Data Definition, Constraints, & Schema changes in SQL, Insert, Delete & update statements in SQL, View in SQL, Specifying constraints and Indexes in SQL, Queries in SQL. **ORACLE –** A Historical perspective, Basic Structure, Data Base Structure and its manipulation in ORACLE, Storage Organization in ORACLE Programming ,ORACLE Applications.

Relational Data Base Design: Functional Dependencies, Decomposition, Desirable properties of decomposition, normal forms based on primary keys (1 NF, 2 NF, 3 NF and BC NF), **Practical Data Base Design:** Role of Information systems in organizations, Data Base Design process, physical Data Base Design in Relational Data bases.

Unit-IV

Transaction Processing concepts : Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schemes and Recoverability, Serializability of Schedules, **Concurrency Control Techniques**: Locking Techniques, Time stamp ordering, Multiversion Techniques, Optimistic Techniques, **Recovery Techniques**: Recovery concepts, recovery Techniques in centralized DBMS, **Database Security**: Introduction to Database Security issues.

References:

1. Elmasri & Navathe : Fundamentals of Database System, 3rd Edition, Addison Wesley, New Delhi.
2. Korth & Silberschatz: Database System Concept, 4th Edition, McGraw Hill International Edition.
3. C.J. Date: An Introduction to Database System 7th Edition, Addison Western New Delhi.
4. Abbey Abramson & Cory: ORACLE SI-A Beginner's Guide Tata McGraw Hill Publishing Company Ltd.

MCA-24 Artificial Intelligence

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Objectives:

- To study about intelligent agent and search methods.
- To study the concept of expert systems.
- To study about representing knowledge.
- To construct plan and methods for generating knowledge.

Learning Outcomes:

By the end of the course students will be able to:

- Understand what the AI is.
- Apply search and knowledge representation techniques to solve AI problems.
- Have ability to identify the solution of AI problems.

UNIT-I

Introduction: Concept and evolution of artificial intelligence, brief description of various application areas of artificial intelligence.

The predicate calculus: Syntax and semantic for propositional logic and FOPL, Censual form, inference rules, resolution and unification.

Knowledge: representation: Network representation-Associative network & conceptual graphs, structured representation: Frames & Scripts.

UNIT-II

Search Strategies & Production Systems: Strategies for state space search-data driven and goal driven search; search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing best first, AN algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.

Types of production system control of search in production system.

UNIT-III

Rule based expert systems: Architecture, development, managing uncertainty in expect systems (Bayesian probability theory, Non-monotonic logic and reasoning with beliefs.

Fuzzy logic: definition, Fuzzy logic systems architecture, difference between Boolean and fuzzy logic.

UNIT-IV

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.

Understanding: What is understanding? What makes it hard? Understanding as constraint satisfaction.

An overview of programming languages for artificial intelligence.

Reference:

1. George F. Luger, William A. Stubblefield, Artificial Intelligence, The Benjamin/Cummings Publishing Company, Inc.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert system, PHI.
3. Eugene Charniak, Drew McDermott, Introduction to Artificial Intelligence" Addison Wesley.
4. Wils J. Nilsson, Principles of Artificial Intelligence, Narosa Publishing house.

5. Jackson Peter, Introduction to Expert systems, 3rd edition, (Addison Wesley -2000).

MCA-25 J2EE and ASP[dot]NET

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Notes: - Total 09 questions are to bet set by the examiner. First question will be compulsory consisting of 5 short answer type question (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Objectives:

- Illustrate the basic concepts and building blocks of J2EE and ASP.Net language programming using tire architecture approach.
- Learn how to write moderately complex programs efficiently.
- Learn making Web based application in J2EE as well as ASP.Net.

Learning Outcomes:

- Knowing essential concepts, principles and theories of J2EE and ASP.Net technology relating the Web application.
- Develop real world programming problems and applications efficiently using advanced libraries of both technologies.
- Knowing about advanced technologies using by experts in field of Information Technology.

Unit I

Data Base Connectivity, Data Base Programming, Queries, Functions, Procedures, Views. Methods of Database connectivity. Database management classes and methods of classes for DDL, DML, DCL.

Unit II

Introduction to J2EE and ASP.Net. HTML tags, XML tags, Java Script Basics: Data Types, operators, decision statements, Loops and Functions. HTML DOM. Events and Cookies. Java Script objects.

Unit III

Application Server, Web Server. Web Development using JSP and Servlet. Life Cycle. Web Development in ASP.Net. Cookies handling. Request Response Objects. Session.

Unit IV

MVC in java and .net. Introduction to: Struts. Spring. Hibernate, AJAX, EJB, SignalR, React, AngularJS.

References:

1. Thomas A Powell, HTML-The Complete Reference, Tata McGraw Hill.
2. ScoteGuelich, ShishirGundavaram, Gunther Birzniek; CGI Programming with Perl 2/e. O'Reilly.
3. Pardi, XML in Action, Web Technology, PHI.
4. Aaron weiss, Rebecca Taply, Kim Daniels, Stuven Mulder, Jeff Kaneshki, Web Authoring Desk Reference, Techmedia Publication.
5. Jeffery R. Shapiro, The Complete Reference Visual Basic .NET, Tata McGraw Hill
6. E. Ealaguruswamy , Programming in C # , Tata McGraw Hill.
7. V.P. Jain , The Complete Guide to C # Programming .
8. Herbert Schildt, C #: A Beginner's Guide, Tata McGraw Hill
9. The Complete Reference ASP.NET. Methew Macdonald. Osborne.
10. ASP.NET Core 2.0. Jon Galloway, Wrox Publication.

MCA-31 WEB DEVELPOMENT

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. To impart the basic concepts of Web Technologies
2. To understand various client side technologies
3. To create web pages
4. To create dynamic applications on web through server side.

Course Learning Outcomes:

1. Be able to use the HTML programming language
2. Be able to use the Design Programs.
3. Publishes the site he/she designed
4. Uses Domain Name and services.
5. Be able to make changes on the Site.
6. Updates on the site when needed.

Unit I

Introduction: Concept of Internet, World Wide Web, URL, Web Server, Web Browser, HTML, HTTP, SMTP, POP3, MIME, IMAP. Web site design principles, planning the site and navigation,

Unit II

HTML and CSS: History of HTML, Structure of HTML Document: Text Basics, Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins.

Unit III

XML: Introduction of XML- Features of XML, Structure of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types. XML Objects.

Unit IV

PHP: PHP Introduction, Structure of PHP, PHP Functions, AJAX with PHP, PHP Code

Text/Reference books:

1. Steven Holzner,"HTML Black Book", Dreamtech Press India Pvt. Ltd. 2000.
2. Developing Web Applications, 2ed by Savaliya, Wiley India Ltd
3. Web Technologies, Black Book, Dreamtech Press India Pvt. Ltd.
4. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India
5. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book by Kogent, Wiley India Ltd.
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

MCA-32 IOT AND CLOUD COMPUTING

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure.
2. The topic introduces students with various concepts like cloud systems, How Cloud Computing Works, Service Models.
3. The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT).
4. The course enables student to understand the basics of Internet of things. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things.
5. To understand the concepts of Web of Things.

Course Learning Outcomes:

1. Describe the evolution that has led to cloud computing and discuss the importance of IoT devices.
2. Identify the Components that form part of IoT Architecture.
3. Evaluate the appropriate protocol for communication between IoT.
4. Discover the fundamentals of Cloud Computing and explain the deployment methods of Cloud Computing.
5. Describe the architecture of Cloud systems.
6. Implement and secure your own cloud service.

Unit I

Internet of Things – Overview and characteristics of IoT, Layered Architecture (3 & 5 Layered) of IoT, Physical Design and Logical Design, Domain specific IoT, Security Issues of IoT,

Unit II

Communication challenges related to IoT, Enabling technologies for IoT, Applications of IoT – Home Automation, Smart cities, Social Life and Entertainment, Health & Fitness, Smart Environment and Agriculture, Supply Chain and Logistics, Energy conservation, Design considerations in an IoT systems.

Unit III

Introduction to Cloud Computing: Evolution of cloud computing, Characteristics of Cloud Computing, Web Services deliver from the cloud - IaaS, PaaS, SaaS, Types of cloud - Public private and hybrid cloud.

Unit IV

Introduction to virtualization, Resource Virtualization - Server, Storage, Network, Load Balancing and Virtualization, Hypervisors and its types, Service Oriented Architecture (SOA), Overview of Security Issues, Challenges and Risks of Cloud.

Text/Reference books:

1. Internet of Things-Architectures and Design principles- Raj Kamal, McGraw Hill Education
2. Cloud computing a practical approach - Anthony T. Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
3. Cloud Computing: Web-Based Applications That Change the Way You Work and
4. Collaborate Online - Michael Miller - Que 2008
5. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman
6. Fern Halper, Wiley Publishing Inc, 2010
7. Cloud Computing (Principles and Paradigms), Edited by Rajkumar, Buyya James

MCA-33(i) LINUX AND SHELL SCRIPT

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. This course will prepare students to develop software in and for Linux/UNIX environments.
2. This include basic operating system concepts, effective command line usage, shell programming.
3. The C language, programming development tools, system programming, network programming (client-server model and sockets), and GUI programming.

Course Learning Outcomes:

1. Understanding the basic set of commands and utilities in Linux/UNIX systems.
2. To learn to develop software for Linux/UNIX systems.
3. To learn the C language and get experience programming in C.
4. To learn the important Linux/UNIX library functions and system calls.
5. To understand the inner workings of UNIX-like operating systems.
6. To obtain a foundation for an advanced course in operating systems.

Unit-I

Unix Operating System, Knowing Your Machine, Linux and GNU, The Unix Architecture, Unix/Linux features, Command Usage, General Purpose Utilities- cal, date, echo, printf, bc, script, Email basics, passwd, who, uname, tty, stty, file system. Linux Startup, Accounts, accessing Linux – starting and shutting processes, logging in and lagging out.

Unit-II

Handling Ordinary Files - cat, cp, rm, mv, more, lp, file, wc, od, cmp, comm, diff, gzip and gunzip, tar, zip and unzip etc., tee

Basic File Attributes- ls, file permissions, Directory Permissions, vi editor, The process, More file Attributes.

Unit-III

Simple Filters- pr, head, tail,cut, paste, sort, uniq, tr etc.

Filters using Regular Expressions- grep and sed.

Unit-IV

awk- An advanced filter- Simple filtering, splitting into fields, variables and expressions etc

perl- The master Manipulator- perl preliminaries, chop function, string handling functions, split, join, for each.

Process Control- pipe, signal, kill process

Text/Reference Books:

1. Sumitabha dass,*Your Unix – The Ultimate Guide*, TMH.
2. John Goerzen,*Linux Programming Bible*, IDG Books, New Delhi.
3. Aho, Hopcoft and Ullman, the *Design and Analysis of Computer Algorithms,* Addison Wesley.
4. Yaswant Kanetkar, "*Unix Shell Programming", BPB Publication.*

MCA-33(ii) ANDROID SOFTWARE DEVELOPMENT

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. Covers introductory mobile application development for the Android Operating System using XML and Java.
2. Includes developing simple applications that could run on Android phones and tablets. Covers Android application development phases, terminologies, application design, and coding.

Course Learning Outcomes:

1. Install and configure Android application development tools.
2. Design and develop user Interfaces for the Android platform.
3. Save state information across important operating system events.
4. Apply Java programming concepts to Android application development.

Unit-I

Android Application Development: Android Application Development: Getting started with Android, Mastering Android Development tools: Using Android Documentation, Debugging Applications with DDMS, Working with Android Emulator.

Unit-II

Building Android Applications: Designing typical Android Application, Using the Application Context, Working with Activities, Working with intents, Dialogs, Fragments, Logging application information.

Unit-III

Managing Application Resources: Working with Simple Resource values, Draw Table Resources, Layouts, Files; Configuring the Android Manifest file and basic application Settings.

Unit-IV

Development of Application: Registering activities, designating the launch activity, Managing Application permissions, designing an application framework.

Text/Reference Books:

1. Burton Michael, Android App Development for Dummies, 3rd Edition, 2015, Wiley
2. Padmini, Android App Development: A Complete Tutorial For Beginners, 2016,eBooks2go

MCA-34(i) NETWORK SECURITY

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. identify, analyse and remediate computer security breaches by learning and implementing the real-world scenarios in Network Security
2. Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
3. Understand key terms and concepts in Cryptography, Governance and Compliance.

Course Learning Outcomes:

1. Analyse and evaluate the cyber security needs of an organization.
2. Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation.
3. Measure the performance and troubleshoot cyber security systems.
4. Design and develop security architecture for an organization.

Unit I

Overview and Security Attacks: Introduction to Network Secuity, Principals of Security, Security Approaches, Security Threats, Types Of Attacks, Virus, Worms, Trojan Horse, Logic Bombs, DoS, Malware , Major attacks of history , Data Security ,Phishing , Trapping.

Unit II

Authentication and Cryptography: Overview of Authentication, Authentication of People, Message Authentication, Public Key Infrastructure, Digital Signature, Kerbros, Overview of Cryptography, Application Of Cryptography, Data Encryption Standard, Advance Encryption Standard.

Unit III

IP and Web Security: IP Security Overview, Architecture, Authentication Header, Encapsulation Security Payload, Key Management, IKE, Web Security Considerations, Secure Socket Layer, Transport Layer Security, Secure Electronic Transaction, Web issues.

Unit IV

System and Email Security: Intruders, Intrusion Detection, Password Management, Malicious Software, Firewalls, Firewall Design Principles, Firewall Configurations, Trusted Systems, Email Security, PEM, S/MIME, PGP.

Reference Books:

1. Cryptography And Network Security, Principles And Practice Sixth Edition, William Stallings, Pearson
2. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
3. Cryptography and Network Security, Atul Kahate, TMH
4. Information Systems Security, Godbole, Wiley India
5. Information Security Principles and Practice, Mark Stamp, Willy India

MCA-34(ii) WIRELESS NETWORK

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. To provide an overview of Wireless Network area and its applications.
2. To explain the various terminology, principles, protocols and mobile communication technologies used in wireless network.
3. To enhance the student's knowledge in the perspective field of wireless network.

Course Learning Outcomes: At the end of this course students will be able to:

1. Explain working of different wireless Network technologies.
2. Demonstrate application of different protocols for wireless communication technologies.
3. Analyse the performance of different technologies in different scenarios/situations.
4. Develop learning and research skills by undertaking a comprehensive study of research topic in wireless network.

UNIT-I

MULTIPLE RADIO ACCESS: Medium Access Alternatives: Fixed-Assignment for voice oriented networks, random access for data oriented networks, Handoff and Roaming Support, Security and Privacy.

UNIT-II

WIRELESS WANS: First Generation Analog, Second Generation TDMA- GSM, Short Messaging Service in GSM, Second Generation CDMA- IS-95,GPRS, Third Generation Systems- WCDMA,CDMA2000, Introduction to LTE.

UNIT-III

WIRELESS LANS Introduction to Wireless LANs- IEEE 802.11 WLAN-Architecture and Services, Physical Layer, MAC Sublayer, MAC Management Sublayer, Other IEEE 802.11standards, Wi-Max standard.

UNIT-IV

ADHOC AND SENSOR NETWORKS: Characteristics and Applications of MANET, Routing Protocols- Table-driven and Source-initiated on Demand routing protocols, Hybrid protocols. Wireless Sensor Networks- Classification. Wireless PANs- Architecture of Bluetooth systems.

Text/Reference Books:

1. Vijay. K. Garg, *Wireless Communication and Networking*, Morgan Kaufmann Publishers.
2. Kaveth Pahlavan, Prashant Krishnamurthy, *Principles of Wireless Networks*, Pearson Education.
3. Adrian Farrel, Bruce S. Davie, P.Z & Larry L. Peterson, *Wireless Networking Complete*, Morgan Kaufmann Publishers.
4. C. Siva Ram Murthy and B. S. Manoj, *Ad hoc Wireless Networks*, Pearson Education.
5. William Stalling, *Wireless Communications and Networks*, Pearson/Prentice Hall of India.

MCA-35(i) DISCRETE MATHEMATICS

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
2. Use sets for solving applied problems, and use the properties of set operations algebraically.
3. Work with relations and investigate their properties.

Course Learning Outcomes:

1. Analyze logical propositions via truth tables and Prove mathematical theorems using mathematical induction.
2. Understand sets and perform operations and algebra on sets.
3. Identify functions and determine their properties.
4. Define graphs, digraphs and trees, and identify their main properties.

Unit-I

Group And Subgroups: Group axioms, Permutation groups, Subgroups, Co-sets, Normal subgroups, Semigroups, FREE Semi-groups, Applications, modular arithmetic, error correcting codes, grammars , language, Finite State Machine.

Unit-II

Graphs: Directed and undirected graphs, chains , Circuits , Paths, Cycles, connectivity, Adjacency & incidence matrices, Minima's path Application (Flow charts and state transition graphs, algorithms for determining cycle and minimal paths, polish notations and trees, flows in network).

Unit-III

Lattice; and Boolean algebra: Relational to Partial ordering, Lattices and Hasse diagram, Axiomatic definition of boolean algebra as algebraic structures with two operations basic results truth values and truth tables. Algebra of propositional function. The Boolean algebra of truth values, Application (Switching circuits, Gate circuits).

Unit-IV

Finite Fields: Definition Representation, Structure, Internal domain Irreducible polynomial, Polynomial roots, splitting field.

Text/Reference Books:

1. Alan Doerr, Kenneth Levaseur, Applied Discrete Structures for Computer Science, Galgotia publication pvt. ltd.
2. Seymour Lipschutz, Marc Lars Lipson, Discrete mathematics, McGraw-Hill international editions, Schaum's series.
3. Bernard Kolman, Robert C. Busbym, Discrete Mathematical structures for computer science, Prentice-Hall of India pvt. ltd.
4. Kennech G. Rosen: Discrete mathematics and its applications, McGraw-Hill internal editions, Mathematics series.

MCA-35(ii) THEORY OF COMPUTATION

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. Introduce students to the mathematical foundations of computation including automata theory
2. The theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
3. Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

Course Learning Outcomes:

1. Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.
2. Explain the models of computation, including formal languages, grammars and automata, and their connections.
3. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
4. Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

Unit- I

Regular sets and regular expressions; Deterministic and Non-Deterministic finite automata, equivalence of deterministic and non-deterministic finite automata, Kleen's characterization theory for sets accepted by finite automata, Regular grammar, state minimization, Mealy and Moore Machine, Problem based on pumping lemma.

Unit-II

Context Free Language, Context Free Grammar. Pushdown Automata - Deterministic push-down and Non-deterministic push-down automata. Closure properties of push-down automata. Derivations, Relationship between derivation and derivation trees, Simplification of CFG. Chomsky normal form (CNF), Greibach normal form (GNF). Closure properties of CFL.

Unit –III

Introduction to compiler and phases. Lexical Analyzer. Linear Bound Automata. Context Sensitive Language. Context Sensitive Grammar. Closure properties of CSL.

Unit –IV

Turing machine, Construction of Turing machine, other models of Turing machine-Multi tape Turing machine, Multidimensional Turing Machines, Halting problem, Chomsky hierarchy of languages. Recursive and Recursively Enumerable Language.

Text/Reference Books:

1. KLP Mishra & N Chandrasekaran, Theory of Computer Science: Automata, Languages and Automata, PHI.
2. Peter Linz, An Introduction to Formal Languages and Automata, Jones & Bartlett.

3. Hop croft, J.E. & Ullman, J.D, Formal Language and their relation to Automata, Addison-Wesley.
4. Zoha Mauna , Mathematical theory of computation, Wiley.
5. John Minsky, Mathematical theory of computation, PHI.
6. M. Greenberg, Introduction to Automata Theory, Addison Wesley.

MCA-35(iii) COMPILER CONSTRUCTION

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. This Course describes the theory and practice of compilation, in particular.
2. the lexical analysis, parsing and code generation and optimization phases of compilation,
3. Design a compiler for a concise programming language.

Course Learning Outcomes:

1. Understand the major phases of compilation and to understand the Lex & YAAC tool.
2. Develop the parsers and experiment the knowledge of different parsers design without automated tools.
3. Construct the intermediate code representations and generation.
4. Apply for various optimization techniques for dataflow analysis.

Unit I

Introduction to Compilation: Introduction to Compilers, Interpreters, Assemblers, phases of compilation, analysis synthesis model of translation, compiler construction tools. Lexical Analysis: Process of lexical analysis, finite state automata, DFA and NFA recognition of regular expressions, LEX.

Unit II

Syntax Analysis: Process of syntax analysis, types of grammars, top-down and bottom-up parsing techniques, Parser generator.

Unit III

Intermediate Code Generation: Intermediate Languages, generating intermediate code for declarative statement, Assignment statement, Boolean expression, and case statement. Code Optimization: Introduction to code optimization, potential cases of code optimization, optimization of basic blocks, loops in flow graphs, code improving transformation.

Unit IV

Code Generation: Issues in the design of a code generation the target machine, dynamic storage management, translating basic blocks, a simple code generator, peephole optimization, directed acyclic graphs and basic blocks code generation from directed acyclic graphs. Overview of syntax directed translation scheme.

Text/Reference Books:

1. Aho, Ullman, & Sethi , Compilers: Principles, Techniques & Tools, Addison Wesley
2. Aho & Ullman, Principles of Compiler Design, Narosa Publications.
3. Henk Alblas , Practice & Principles of Compiler Building with C.
4. Trembley & Sorenson, Principles of Compiler Design, McGraw Hill.

MCA-41 PYTHON PROGRAMMING

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. GUI Programming and Databases operations in Python
6. Network Programming in Python

Courses Learning Outcomes:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision Making statements and Functions
3. Interpret Object oriented programming in Python
4. Understand and summarize different File handling operations
5. Design and develop Client Server network applications using Python

UNIT-I

Introduction Installing And Working With Python, Tokens, Operators, Data Types, Sequence Types, Mapping Types: Dictionaries, Tuples. Control Structures: Conditional Branching, Looping, Custom Functions: Names And Doc string, Argument And Parameter Unpacking.

UNIT-II

Sequences, iteration and recursion. Modules And Packages Modules And Packages, Overview Of Python Standard Library. OOPS Concepts And Classes In Python,.

UNIT-III

Exception handling: catching and raising exceptions, custom exceptions. File Handling and Writing and Reading, Binary Data, Writing and Parsing Text Files, Writing and Parsing XML Files, Random Access Binary Files.

UNIT-IV

Database programming. Numpy basics: Introduction, data types, arrays: indexing, slicing, shape, iteration, join, split, search, sort, filter.

Text/Reference Books:

1. Mark Summerfield, “Programming in python
2. A Complete Introduction to Python Programming”.
3. Mark Lutz, “Learning Python”, O Reily, 4th Edition, 2009.
4. Brian K. Jones, “Python Cookbook”.
5. Alex Martelli, “Python in a nutshell”.
6. Tim Hall and J-P Stacey, “Python 3 for Absolute Beginners”, 2009.

MCA-42 R PROGRAMMING

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives

1. Understanding of R System and installation and configuration of R-Environment and R-Studio.
2. Understanding R Packages, their installation and management.
3. Understanding of nuts and bolts of R.
4. Application of R Programming in Daily life problems
5. Visualizing data using R with different type of graphs and charts
6. Applying R Advance features to solve complex problems and fine tuning R Processes

Course Learning Outcomes:

1. Understand the basics in R programming in terms of constructs, control statements, string functions
2. Understand the use of R for Big Data analytics
3. Learn to apply R programming for Text processing
4. Able to appreciate and apply the R programming from a statistical perspective

Unit I

Introduction to R, variables, data types, comments, operators, decision making, loops.

Unit II

Functions, Mathematical functions, R Data Structures: String, functions on string, Vectors, working with vectors, Lists, Arrays, R Matrices, Data Frames, Factors.

Unit III

R Graphics: R Plot, R Line, R Scatterplot, R Pie Charts, R Bars

Unit IV

R Statistics: Introduction, R Data Set, R Max and Min, R Mean Median Mode, R Percentiles.

Text/References Books:

1. Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016
2. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013
3. A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009

MCA-43(i) SOFT COMPUTING

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. Study the needs and applications of soft computing.
2. To learn how natural and biological systems influence the computational field.
3. Provide knowledge and applications of Neural Network, Fuzzy Logic , Genetic Algorithms, Natural Computing.

Course Learning Outcomes:

1. Have an in-depth understanding of some of the soft computing techniques.
2. Identify the situations for which it is beneficial to apply soft computing techniques.
3. Describe and Apply suitable soft computing techniques for the problems which could not be otherwise solved efficiently.
4. Be able to understand how large numbers of agents can self-organize and adapt.

UNIT I

Introduction to Soft Computing- Introduction, Artificial Intelligence, Artificial Neural Network, Fuzzy System, Genetic Algorithms, Swarm Intelligent Systems, Expert System.

UNIT II

Artificial Neural Network –First Generation – Biological Inspiration, ANNs and Classification of ANNs. Perceptron Network, Adaline Network, Madaline Network.

Artificial Neural Network –Second Generation- Introduction, Back propagation Neural Network, Hamming Neural Network, Bi-directional Associative memory.

UNIT III

Artificial Neural Network –Third Generation- Introduction**,** Spikes Neuron Models

Fuzzy Logic- Probability Theory vs Possibility Theory, Fuzzy Set and Operations, Applications

UNIT IV

Genetic Algorithm- Procedures, Applications.

Swarm Intelligence- Background of SIS, Ant Colony System and its working, Particle swarm intelligence system, Artificial Bee Colony System, Cuckoo search algorithm.

Text/Reference Books:

1. Soft Computing with Matlab Programming- N.P. Padhy, S.P. Simon, Oxford Publications
2. Zbigniew Michalewicz, Genetic algorithms +Data Structures = Evolution Programs, Springers-Verlag.
3. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall.
4. S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI.
5. Simon O. Haykin, Neural Networks, A Comprehensive Foundation, PHI.

MCA-43(ii) MACHINE LEARNING

L/T - 4 **Total Credits – 4** **Internal Marks 30**
External Marks 70

Notes: - Total 09 questions are to bet set by the examiner. First question will be compulsory consisting of 5 short answer type question (each carry 2 marks) covering the entire syllabus uniformly. In addition, 08 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A Candidate is required to attempt five questions in all selecting one from each unit including the compulsory question.

Course Learning Objectives:

1. Be able to understand and apply supervised and unsupervised learning algorithms.
2. Understand the fundamental concepts in machine learning and popular machine learning algorithms.
3. Understand the basic concept of Deep Learning.
4. Be able to solve the problems related to the application of machine learning algorithms with programming.

Course Learning Outcomes:

1. Recognize major programming languages.
2. Identify potential applications of machine learning in practice.
3. Select the suitable machine learning tasks for given application.
4. Implement feature extraction and selection to represent data as features to serve as input to machine learning models.

Unit 1

Basics of Machine Learning; Introduction to Artificial Intelligence and Machine Learning, Types of Machine Learning and its comparisons, Applications of Machine Learning, Issues in Machine Learning.

Unit II

Preparing to Model: Introduction, Machine Learning Activities, Types of Data in Machine Learning, Exploring structure of data, Data Pre-processing(Dimension Reduction and Feature subset selection), Model Selection.

Unit III

Supervised Learning: Introduction, Classification (Introduction, classification model, learning steps, Common classification algorithm), Regression (Linear Regression, Multivariable Regression, Logistic Regression),.

Unit IV

Unsupervised Learning: Introduction and its applications, Techniques in Unsupervised Learning (Clustering, K-Means).

Neural Network: Introduction, Architecture of Artificial Neural Network.

Text/Reference Books:

1. Saikat Dutt, Machine Learning, Pearson, 2019.
2. Tom Mitchell, Machine Learning (First Edition), McGraw- Hill, 1997
3. Anuradha Srinivasaraghavan, Vincy JOdeph, Machine Learning,Wiley, 2019
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press. 2016.
5. E. Alpaydin, Introduction to machine learning, MIT Press, 2e, 2009

6. P. Harrington., Machine Learning in Action, Manning Publication, 2012.

MCA-43(iii) GENETIC ALGORITHM

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives

1. A gentile introduction to evolutionary algorithm, its working principles.
2. Mathematical underpinnings, its extensions to solve different kinds of optimization problems including nonlinear constraint handling.
3. Multi-objective optimization and scheduling problems will be introduced.

Course Learning Outcomes:

1. Explain the principles underlying Evolutionary Computation in general and Genetic Algorithms in particular.
2. Apply Evolutionary Computation Methods to find solutions to complex problems.
3. Analyze and experiment with parameter choices in the use of Evolutionary Computation.
4. Summarize current research in Genetic Algorithms and Evolutionary Computing.

Unit I

INTRODUCTION: Introduction to Evolutionary Algorithm, History of Evolutionary Algorithm, Advantage of evolutionary algorithm, Application of evolutionary algorithm, Biological and AI , Introduction of Genetic Algorithm, Difference between traditional approach and Evolutionary algorithm.

Unit II

Genetic modelling: Basic Terminologies and operators like individual, gene, alleles, phenotype and fitness function. Simple genetic algorithm, its representation, Advantage and Limitation of genetic algorithm.

Unit III

Operators of GA: Selection: Roullete wheel selection, random, rank, tournament, Boltzmann selection, Crossover: Singlepoint, twopoint, multipoint, ordered, uniform, Mutation: Flipping, Interchanging, reversing, replacement and crossover rate, mutation rate, convergence criteria.

Unit IV

Theoretical Analysis of Evolutionary Algorithms: Diploid, Dominance and abeyance, inversion and reordering operator, fitness scaling, Niching and Speciation.

Text/Reference Books:

1. D.E. Goldberg, *Genetic Algorithms in Search, Optimization and Machine Learning*. Pearson Education Asia.
2. M. Mitchell, *An introduction to genetic algorithms*, MIT Press.
3. L. D. Davis, *Evolutionary algorithms*, Springer-Verlag.

4. K. Srinivasa Raju and D. Nagesh Kumar, ***M****ulti-criterion Analysis in Engineering and Managemet*, PHI Learning Pvt. Ltd., New Delhi, India.
5. S.N. Sivanandam, S.N. Deepa, *Introduction to Genetic Algorithms*, Springer.
6. Eiben And Smith, *Introduction To Evolutionary Computing*, Springer

MCA-44(i) DATA WAREHOUSING AND DATA MINING

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:- Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives

1. To identify the scope and essentiality of Data Warehousing and Mining.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To study spatial and web data mining.
4. To develop research interest towards advances in data mining.

Course Learning Outcomes:

1. Understand Data Warehouse fundamentals, Data Mining Principles
2. Design data warehouse with dimensional modeling and apply OLAP operations.
3. Identify appropriate data mining algorithms to solve real world problems
4. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
5. Describe complex data types with respect to spatial and web mining.
6. Benefit the user experiences towards research and innovation. Integration.

Unit I

Data Mining: Introduction: Motivation, Importance, data mining, kind of data, Functionalities, interesting patterns, classification of data mining system, Major issues, Data Mining Primitives. Data Preparation: Preprocess, Data cleaning, Data Integration and transformation, Data reduction, Discritization and concept hierarchy generation.

Unit II

Data warehouse and OLAP Technology for data mining: data warehouse, difference between operational data base systems and data warehouse, A Multidimensional Data Model, Architecture, Implementation, data warehousing to data mining, Data warehouse usage.

Unit III

Association Rule Mining: Mining single-dimensional Boolean association rules from transactional databases, mining multilevel association rules from transaction databases, Mining multidimensional association rules from relational databases and data warehouses, From association mining to correlation analysis, constraint-based association Mining.

Unit IV

Classification and prediction, issues, classification by decision induction, Bayesian classification, classification by back propagation, classification based on concepts from association rule mining other classification methods .Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis, Applications and Trends in Data Mining.

Text/Reference Books:

1. Ale Berson, Stephen Smith, Korth Theorling, *Data Mining*,TMH.

2. Adruaans, Longman, Addison-wesley *Data Mining,*
3. Addison-wesley Longman, *Data Warehousing in the Real World.*
4. Chanchal Singh, *Data Mining and Warehousing,* Wiley.
5. John E, Herbert P, *Data Mining*.

MCA-44(ii) BIG DATA ANALYTICS

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
4. To enable students to have skills that will help them to solve complex real-world problems in for decision support.

Course Learning Outcomes:

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
3. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
4. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

UNIT I

Introduction, Wholeness of Big Data, Big Data Sources and Applications, Big Data Architecture.

UNIT II

Distributed Computing Using Hadoop, Parallel Processing with Map Reduce, Application and Programming. NoSQL Databases, Big Data Programming Languages – Apache Hive, Apache Pig.

UNIT III

BIG DATA PRIVACY, ETHICS AND SECURITY - Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? , Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security

UNIT IV

SECURITY, COMPLIANCE, AUDITING, AND PROTECTION- Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems, HADOOP SECURITY DESIGN Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration, DATA SECURITY & EVENT LOGGING Integrating

Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in Hadoop cluster.

Text/Reference Books:

1. Big Data- Anil Maheshwari, McGraw hill.
2. Frank Ohlhorst John Wiley & Sons, “Big Data Analytics: Turning Big Data into Big Money”, John Wiley & Sons, 2013.
3. Sherif Sakr, “Large Scale and Big Data: Processing and Management”, CRC Press, 2014.
4. Sudeesh Narayanan, “Securing Hadoop”, Packt Publishing, 2013.
5. Ben Spivey, Joey Echeverria, “Hadoop Security Protecting Your Big Data Problem”, O’Reilly Media, 2015.
6. Boris Lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
7. Chris Eaton, Dirk Deroos et al. , “Understanding Big data ”, McGraw Hill, 2012. 3. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012

MCA-45(iii) DATA SCIENCE

L/T - 4 **Total Credits – 4** **Internal - 30 Marks**
External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

Course Learning Objectives:

1. To know the fundamental concepts of data science and analytics
2. To learn various techniques for mining data streams
3. To learn event modelling for different applications.
4. To know about Hadoop and Map Reduce procedure

Course Learning Outcomes:

1. Work with big data platform and its analysis techniques.
2. Design efficient algorithms for mining the data from large volumes.
3. Model a framework for Human Activity Recognition.
4. Development with cloud databases

UNIT I

INTRODUCTION TO DATA SCIENCE – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II

DATA ANALYSIS: Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics –

UNIT III

DATA MINING TECHNIQUES: Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

UNIT IV

FRAMEWORKS AND VISUALIZATION: Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems –

Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications.

Text/Reference Books

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
4. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
5. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly Publishers, 2013.
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly Publishers, 2013.
7. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014.
8. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks Using Matlab 6.0”, Tata McGraw- Hill Education, 2006.