Indira Gandhi University, Meerpur

Rewari

Syllabus for MCA- Regular

Session –w.e.f. 2020-2021

MCA Programme's Objectives:

The broad objective of the MCA programme is to prepare post graduates for productive careers in software industry, corporate sector, Govt. organizations and academia by providing skill based environment for teaching and research in the core and emerging areas of the discipline. The Programme's thrust is on giving the students a thorough and sound background in theoretical and skill-oriented courses relevant to the latest computer software development. The programme emphasizes the application of software technology to solve mathematical, computing, communications/networking and commercial problems. This Master's Degree Programme has been designed with a semester approach in mind. The first year courses are aimed at skills development in computers using various technologies and focused on core courses providing conceptual frame work and the second year provides the specialization and the project work.

1. Produce knowledgeable and skilled human resources which are employable in IT and ITES.
2. Impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
3. Produce entrepreneurs who can develop customized solutions for small to large Enterprises.
4. To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.
5. To develop students to become globally competent.
6. To inculcate Entrepreneurial skills among students

Expected Programme Outcomes

The **Master of Computer Applications(MCA)** Programme will prepare its graduates to achieve:

1. The understanding to apply knowledge of computing and technological advances appropriate to the programme.
2. Skills to analyze a problem, and identify and define the logical modeling of solutions.
3. An ability to design implements and evaluate a computer-based system, process, component, or programme to meet stakeholder needs.
4. The knack to function effectively in teams to accomplish a common goal.
5. A sense of professional, ethical, legal, security and social issues and responsibilities.
6. Effectiveness in communicating with a wide range of audiences.
7. An ability to analyze the local and global impact of business solutions on individuals, organizations, and society.
8. An identification of the need to engage in continuing professional development.

Indira Gandhi University Meerpur Rewari
Master of Computer Applications (MCA) Regular Programme
Syllabus and Scheme of Examination (CBCS)
w.e.f. 2020-21

A Bridge course (qualifying in nature) of duration 2-3 weeks will be given to students of non-IT background before the commencement of first year/semester classes.

	Course Name	**Hours**
1.	MCA-BC1-Foundation Programming language	20
2.	MCA-BC2-Foundation for Mathematics and Architecture	10+10
3.	MCA-BC3-Programming Language Lab	
4.	Evaluation after Bridge Course	**Two 3 Hour Theory of 100 marks** **One 3 Hour lab of 50 marks.**

Note: A student has to take 40% marks to clear the bridge course. Its credit will not be added in the final mark sheet. A student has to compulsorily clear the bridge course to get the degree of MCA.

MCA First Year
Semester-I

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2101	Object Oriented Programming with Java	5:0:0	5	80	20	100
MCA-2102	Modern Operating System with UNIX	5:0:0	5	80	20	100
MCA-2103	Computer Networks	4:0:0	4	80	20	100
MCA-2104	Computer Graphics & Multimedia	4:0:0	4	80	20	100
MCA-2105	Software Engineering & Testing	4:0:0	4	80	20	100
MCA-2106	Software Lab-1 Java Programming Lab	0:0:4	2	80	20	100
MCA-2107	SoftwareLab-2 CG Lab	0:0:4	2	80	20	100
MCA-2108	Software Lab-3 Unix Lab	0:0:4	2	80	20	100
MCA-2109	Seminar	-	1	-	-	25
MCA-2110	Self Study Paper	-	1	-	-	25
			30	**640**	**160**	**850**

*Practical Examination of MCA-2106, 2107 & 2108 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA First Year
Semester-II

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2201	Data Structures and Algorithms	5:0:0	5	80	20	100
MCA-2202	Database Design Concepts	4:0:0	4	80	20	100
MCA-2203	Artificial Intelligence	4:0:0	4	80	20	100
MCA-2204	Theory of Computation	4:0:0	4	80	20	100
MCA-2205	Elective-I	4:0:0	4	80	20	100
MCA-2206	Software Lab-4 Data Structures Lab	0:0:4	2	80	20	100
MCA-2207	Software Lab-5 Database Lab	0:0:4	2	80	20	100
MCA-2208	Software Lab-6 Advance Java lab	0:0:4	2	80	20	100
MCA-2209	Seminar	-	1	-	-	25
MCA-2210	Self Study Paper	-	1	-	-	25
	Foundation Elective (FEC)		2			
	Total Credits		**31**	**640**	**160**	**850**

*Practical Examination of MCA-2206, 2207 & 2208 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA Second Year
Semester-III

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2301	Data Mining and warehouse	4:0:0	4	80	20	100
MCA-2302	Machine Learning & Data Analytics using Python	4:0:0	4	80	20	100
MCA-2303	Soft Computing	4:0:0	4	80	20	100
MCA-2304	Principles of Systems Programming & Compiler Design	4:0:0	4	80	20	100
MCA-2305	Computer Organization & Architecture	4:0:0	4	80	20	100
MCA-2306	Software Lab-7 Python Lab	0:0:4	2	80	20	100
MCA-2307	Software Lab-8 Web Technologies Lab	0:0:4	2	80	20	100
MCA-2308	Minor Project with IoT Lab	0:0:2	2	25	25	50
MCA-2309	Seminar	-	1	-	-	25
MCA-2310	Self Study Paper	-	1	-	-	25
	Open Elective (To be Chosen from the pool of Open Electives provided by the University)		2			
			30	**585**	**165**	**800**

*Practical Examination of MCA-2306 & 2307 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA Second Year
Semester-IV

Paper Code	Course	University Exams	Internal Assessment	Total	Credits
MCA-2401	Elective-II	80	20	100	4
MCA-2402	Elective-III	80	20	100	4
MCA-2403	Research/Technical Seminar	-	-	25	1
MCA-2404	Major Project	400	100	500	14

Note: For elective-II & III course, the students will opt the MOOC's courses and submit the certificate in the University. The credits will be transferred accordingly in their mark sheet by the university.

List of Elective Papers

		Elective-I		
	1	Cloud Computing		**Elective-I** is being offered depending upon the availability of expertise and the required infrastructure determined by the University, any one of the following subjects (minimum 10 students are required for any elective-I subject.)
	2	Cyber Security		
	3	Analysis Design Algorithms		
	4	Network Security & Cryptography		
	5	Optimization Technique		
	6	Mobile computing		
	7	Internet of Things (IOT)		
	8	Neural Network		

List of Elective Papers

		Elective-II		Elective-III
	1	Multimedia and Animation	1	R Programming
	2	Blockchain Technology	2	NOSQL
	3	Distributed Databases Concepts	3	SCILAB
	4	Deep Learning	4	Hadoop
	5	Quantum Computing	5	Natural Language Processing

General Instructions

1. **Seminar**

Max.Marks-25

Students are required to prepare a presentation on any topic, not from syllabus, assigned by the teacher concerned in the department on the theme/topic such as review of research papers/articles published in national or internal journal or any other research based paper in his/her area of interest. Every candidate will have to deliver a seminar of 15-20 minutes duration on the assigned topic. The seminar will be delivered in the presence of students and teachers of the department on any fixed week day of the semester.

The seminar will be evaluated by an internal committee of two internal teachers, constituted by the Chairperson of the Department. The evaluation (internal evaluation only) will be based on the presentation of the student, depth of subject matter of the topic and answer to questions. There will be a Coordinator to be nominated by the Chairperson of the Department among the teachers of the Department..

Distribution of marks will be as follows:

1. Presentation = 10 Marks
2. Relevancy & Depth of subject matter of the topic = 10 Marks
3. Answers to the Questions = 5 Marks

2. **Self Study Paper**

The objective of this course is to create habits of reading books and to develop writing skills in a manner of creativity and originality. The students will select a topic of their interest with consultation with their teachers/In charge/mentors. After selecting a suitable title for the paper, the student will be required to prepare a hand written report about 6-10 pages in his/her own handwriting. The student will be required to submit the report after getting it checked by the concerned teacher and will be asked to resubmit the report after making the required correction (s) if any before the commencement of the examination of that semester. The structure of the paper will include the following:

- Introduction
- Main Body
- Conclusion

The thoughts presented in the paper must be original work of the students.

The paper will be evaluated by the panel (one external and one internal examiner) to be appointed by the Chairperson of Department from the prescribed panel of the University.

The evaluation of Self Study paper will be done as given below:

- Evaluation of the paper 15 Marks
- Viva-voce on the paper 10 Marks
- Total 25 Marks

Bridge Course

MCA-BC1-Foundation of Programming Language

Max. Marks: 100
Time: 3 Hrs.

Unit-1

Computer Fundamentals: Computer definition, Generation, input/output devices, operating System definition and its type. Software and its type, office: word, power point, excels etc.

Programming concepts using C language: Work with primitive types and expressions , basic structure of a C Program, standard I/O, Character Set and Tokens, Data Types, Variables and Constants, Operators and Expressions, memory allocation

Unit -2

Control structure and Array: Control the flow of Program using Conditional statements and Loops, Functions and its type, type of arguments passing in function, Arrays and Strings, Pointers, Pointer to an array, Array of pointers, Pointers and functions, Structures and Union

Unit -3

Object Oriented Concept: concept of OOPS, Characteristics of OOPS, Inheritance, constructor and its type, destructor, static and const with classes, operator overloading, friend and virtual functions.

Unit-4

Streams and Files: Streams classes, command line arguments, disk file I/O with streams, file pointers, error handling in file I/O with member function.

Templates and Exceptions: Function templates, Class templates, Exceptions and its type.

Basic Principles of Management: Introduction to principles of management: Planning, organizing, staffing, Budgeting, Controlling. Scope of IT applications in management, and its benefits, socioeconomic environment and information systems and its impact, Strategic role of IT in organizations

MCA-BC2-Foundation for Mathematics and Architecture

Max. Marks: 100
Time: 3 Hrs.

Unit-1

Set and its Operation : Set theory ,Sets and their representations; empty set; finite and infinite sets; equal and equivalent sets; subsets; power set; universal set; Venn diagrams; complement of a set operation on sets; applications of sets. Mathematical Logic, Basic Logical connections; Conjunction; Disjunction; Negation; Negation of Compound Statements; Truth tables. Tautologies; Logical Equivalence.

Unit-2

Algebra, Matrix and statistics: Modern algebra Binary Operation; Addition Modulo n; Multiplication modulo n, Matrices and Determinants Definition of a matrix; Operations on matrices; Square Matrix and its inverse; determinants; the inverse of a matrix, basics Statistics Measures of central Tendency; Standard Deviation; Variance.

Unit-3

Digital Logic and Computer Organization: Computer Evolution: Brief history of Computer, Classification of Computer, Structure of a Computer System, Arithmetic Logic Unit, Control Unit, Bus Structure, Von Neumann Architecture. Bootstrapping.

Number Systems: Decimal, Binary, Octal, Hexadecimal conversion from one to another, Basic Arithmetic Operations: Integer Addition and Subtraction, Signed numbers, Binary Arithmetic, 1's and 2's Complement Arithmetic, Fixed and Floating point numbers, Floating point representation.,

Unit-4

Digital Logic: Logic gates, Boolean Algebra, Basic theorem and Properties of Boolean algebra. Basic concepts on Combinational Circuits and Sequential circuits

Control Unit Design: Basic Concepts - Instruction execution cycle - sequencing of control signals

Memory Organization and I/O: Characteristics of Memory Systems, Main Memory, Types of Random-Access Memory and ROM, Organization, Static and dynamic memories. Understanding Cache Memory and Virtual Memory ,Input / Output Organization: Accessing I/O devices – Understanding Programmed I/O, Interrupt I/O and Direct memory access (DMA)

MCA-BC3: Programming Language Lab

Max. Marks: 50
Time: 3 Hrs.

Practical's based on the course MCA-BC1.

Semester -1

MCA-2101: OBJECT ORIENTED PROGRAMMING WITH JAVA

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

The main objective of subject is to make the clear the fundamentals concept of java programming. After studying this subject the student will be able to know install process of the software in system as well as he/ she will able to design the application using this technology.

Unit – I

Object-Oriented Languages, **Java'**s History, Creation of Java, Java for the Internet, Byte-code, Features, Object-Oriented Programming in Java.

Java Program Structure and Jav**a'**s Class Library, Data Types, Variables, and Operators, Operator Precedence. Selection Statements, Scope of Variable, Iterative Statement. Defining Classes & Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, Variable this, Defining and Using a Class, Automatic Garbage Collection.

Arrays and Strings: Arrays, Arrays of Characters, String Handling Using String Class,Operations on String Handling Using, String Buffer Class.

Unit – II

Extending Classes and Inheritance: Using Existing Classes, Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Abstraction through Abstract Classes, Final Modifier, Universal Super class-Object Class

Packages & Interfaces:. Define Package, type of package, classpath, standard packages, Access Protection in Packages, Concept of Interface

Exception Handling: Concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining your own Exceptions.

Multithreading Programming: Java Thread Model, Define Threads, Main Thread, Creating a new Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks Inter-thread communication, Deadlocks

Unit – III

Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, ReadingConsole Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

Creating Applets in Java: Applet Basics, Architecture, Life Cycle, Display Methods, Requesting Repainting, Status Window, The HTML APPLET Tag Passing Parameters to Applets.

Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating Frame Window in an Applet, Displaying Information Within a Window.

Working with Graphics and Texts: Working with Graphics, Color and Font, Paint Mode Setting,

Managing Text Output using Font Metrics, Exploring Text and Graphics. Working with AWT Controls, Layout Managers and Menus.

Unit – IV

Introduction to Servelets: Lifecycle of a Serverlet, JSDK, Servelet API, javax.servelet Package, Reading Servelet parameters, Initialization parameters. javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies- Session Tracking, Security Issues.

Introduction to JSP, Problem with Servelet, Anatomy of JSP page, JSP Processing, JSP Application Design with MVC, Setting Up and JSP Environment:, Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

Suggested Readings:

1. The Complete Reference JAVA, TMH Publication.
2. Beginning JAVA, Ivor Horton, WROX Public.
3. JAVA 2 UNLEASHED, Tech Media Publications.
4. JAVA 2(1.3) API Documentations.
5. Any other book(s) covering the contents of the paper in more depth.

Learning Outcomes:

1. Have demonstrated comprehension in relevant areas of mathematics (including calculus, discrete math, and probability), and in the area of logic design.
2. Have demonstrated comprehension in fundamental topics of computing, including the intellectual core of computing, software design and development, algorithms, computer organization and architecture, and software systems.
3. Have applied knowledge of areas of computing to analyze and evaluate algorithms, designs, implementations, systems, or other computing artifacts or work-products. Application of this knowledge includes the ability to design, conduct and evaluate the results of experiments and testing activity.
4. Have applied knowledge of areas of computing to create solutions to challenging problems, including specifying, designing, implementing and validating solutions for new problems.

MCA-2102: MODREN OPERATING SYSTEM WITH UNIX

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

The main objective of the subject to provide knowledge to the student about the working of the different type operating system as well as student can understand the functionality of input and output device interaction with the system. After studying this subject also able to know the use of memory and file with the process management

UNIT - I

Theoretical Concepts of Windows and UNIX operating system: Basic feature of Operating System; Process Concepts and CPU Scheduling, Multithreaded Programming, Scheduling Criteria, Scheduling Algorithm, Multiple-Processor Scheduling, Real-Time Scheduling. File Structure; Memory Management: Swapping, Demand paging, Virtual Memory, Critical Section Problem, Mutual Exclusion Problem.

UNIT – II

Introduction of Deadlock, methods of handling, Prevention and Avoidance, Deadlock Detection, and Recovery from Deadlock, Disk Scheduling.

Getting Started with UNIX: User Names and Groups, Logging in; Format of UNIX commands; Changing your password; Characters with Special Meaning; Files and Directories; Current directory looking at the Directory contents, Absolute and Relative Pathnames, Some UNIX Directories and Files; Looking at File contents; File access Permissions; Basic operation on Files; Changing Permission Modes; Standard files, Standard output; Standard Input, Standard Error.

UNIT - III

Filter and pipelines ,Text Manipulation: Inspecting Files; File Statistics, Searching for Patterns; Comparing Files; Operating on Files; Printing Files, Rearranging Files; Splitting Files; translating characters; calculator command, Nice command, Processes: Finding out about Process; Stopping Background Process. File System; Block and Fragments, I-nodes, Directory Structure; User to User Communication. UNIX Editor vi.

UNIT - IV

Shell Programming: Programming in the Borne, C-Shell and Korn-Shell; Wild cards; simple shell programs; Shell variables; interactive shell scripts; AWK utility.

System Administration: Definition of system administration; Booting the system; Maintaining user accounts; File systems and special files; Backups and restoration; Role and functions of a system manager. Overview of the Linux operating system, Difference between LINUX and UNIX.

References:

1. Silberschatz & Galvin: Operating System Concept, Wiley, Latest Edition.
2. Yashawant Kanetkar: Unix Shell Programming, BPB.
3. Sumitabha Das : UNIX Concepts and Appliaction – Faeturing SCO UNIX and LINUX 2nd TMH
4. William Stallings: Operating Systems, PHI, Latest Edition.
5. Maurice Bach : Design of the UNIX Operating System Prentice

Learning Outcomes:

1. Understand Operating System concepts
2. Use System calls and memory management
3. Use Unix commands and editors
4. Carry out Unix File management and shell programming in Unix
5. Do Network configuration and security management in Unix

MCA-2103: COMPUTER NETWORKS

Max Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. Aim of this course is to discuss and explain about basics of data communication and networking concepts.
2. After studying the subject student will be able to understand the working of different type of protocol of networking and model such as OSI reference model, CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing etc.

Unit – I

Data Communication: Introduction of data communication; analog and digital signals; asynchronous and synchronous transmission; Data Encoding and Modulation Techniques, Broadband and Base band transmission; Pulse Code Modulation, bandwidth, channel, baud rate of transmission; Multiplexing; Transmission Medium; transmission errors - error detection and correction.

Unit – II

Network Classification: PAN, LAN, MAN, WAN and wireless network; Network Topology; Network Modes; internet, intranet and Extranet; X.25, frame relay, narrow band and broad band ISDN, ATM.
Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO- OSI reference model, TCP/IP reference model; internet protocol stacks.

Unit – III

Data Link Layer Functions and Protocols: Framing, Error-control, Flow-control; sliding window protocol; HDLC; Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State and Distance Vector Routing
Medium Access Sub layer: CSMA/CD Protocol, switched and fast Ethernet, Token Bus, Token Ring, FDDI, IEEE standards for LAN and MAN; satellite networks.

Unit – IV

Network functions and protocols: Switching Concept; cell switching, routing and congestion control, TCP/IP protocol architecture. Network Device: Repeater, hub, switch, router and gateway; IRC ; TCP and UDP.
Network Applications: File transfer protocol, E- mail, World Wide Web, Client-Server Envionment, DNS.

Suggested Readings:

1. A.S. Tanenbaum: Computer Networks (4th ed.), Prentice-Hall of India.
2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
3. P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.
4. Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.
5. L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan Kaufmann.
6. William Stallings: Data and Computer Communications, Pearson Education.

Learning Outcomes:

1. Recognize and Describe about the working of Computer Networks.
2. Illustrate reference models with layers, protocols and interfaces.
3. Summarize functionalities of different Layers. Combine and distinguish functionalities of different Layers.
4. Model the LAN and WAN configuration using different media.
5. Examine problems of a computer networks.

MCA-2104: COMPUTER GRAPHICS AND MULTIMEDIA

Max. Marks: 80
Times: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. Subject will help to understanding the core concepts of Computer Graphics. Student will be able to work on scan conversion, 2D, 3D – transformation and viewing and will be able to create interactive computer Graphics with understanding of shading.
2. This subject also helps to develop software in the Computer Graphics and Multimedia fields of increasing size and complexity across different application areas.

Unit – I

An Introduction Graphics System: Computer Graphics and Its Types, Application of computer graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input Devices, Hard Copy Devices, Graphics Software.

Output Primitives and Attributes of Output Primitives: Output Primitives Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Anti-aliasing.

Unit – II

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing

Two-Dimension Viewing: The viewing Pipeline, Window to view port coordinate transformation, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Three–Dimensional Concepts: Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Unit – III

Curves and Surfaces: Bezier Curves, Conditions for smoothly joining curve segments, Bezierbi-cubic surface patch, B-Spline Curves, Cubic BSpline curves using uniform knot vectors, testing for first and second order continuities

Shading and Hidden Surface Removal: Shading, Illumination Model for diffused Reflection, Curved Surfaces, Gourard Shading, Phong Model, Hidden Surface Removal, Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, BSP-Tree Method.

Unit – IV

Multimedia: Introduction to Multimedia: Classification of Multimedia, Multimedia Software, MIDI, Components of Multimedia – Audio: Analog to Digital conversion, Audio play backing and recording Video, Text: Hyper text, Hyper media and Hyper Graphics, Graphics and

Animation: Classification of Animation, process of animation, Authoring Process and Tools.

Suggested Readings:

1. Donald Hearn and M.Pauline Baker: Computer Graphics, PHI Publications
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.**17**
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Tosijasu, L.K. : Computer Graphics, Springer-verleg.
6. S Gokul: Multimedia Magic, BPB Publication.
7. Bufford: Multimedia Systems, Addison Wesley.
8. Jeffcoate : Multimedia in Practice, Pretice-Hall.
9. Any other book(s) covering the contents of the paper in more depth.

Learning Outcomes:

1. Have a basic understanding of the core concepts of computer graphics.
2. Be capable of using OpenGL to create interactive computer graphics.
3. Understand a typical graphics pipeline.
4. Have made pictures with their computer.

MCA-2105: SOFTWARE ENGINEERING & TESTING

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. This course will enhance technical skill of students for employment in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and also expanded leadership responsibility.
2. Demonstrate the ability to work effectively as a team member and/or leader in an ever-changing professional environment.

Unit – I

Software Engineering Paradigms: Software Characteristics, Software myths, Software Application, Software Process Models, Process iteration, Process activities, CASE Tools. Software Project management: Management activities, Project planning, Project scheduling, Risk management and activities. Software Requirements engineering: Requirements Engineering Process, Phase, Type of software Requirements, Software Requirements specification Document, Specification languages.

Unit – II

Software Metrics and Measures: Process Metrics, Project metrics, Software Project Estimation Models: Empirical, Putnam, COCOMO models. Software Design Process, Principles of software design, Design Strategies, Levels of Software Design, Interface Design, Coding and Software Reuse. Software Testing, Testability and features of Test cases, Software Reliability, Software Safety, Defect testing, Debugging Tools, Software Testing techniques; WBT, BBT, Ticking Box testing; static analysis, symbolic testing, program mutation testing, input space , partitioning, functional program testing, data flow guided testing.

Unit – III

Software Testing Strategies: Approach, Issues; integration, incremental, System, alpha, Beta testing etc; Comparative evaluation of techniques: Testing tools; Dynamic analysis tools, test data generators, Debuggers, test drivers etc. Technical Metrics for Software: Quality Factors, framework; Metrics for analysis, design, testing source code etc. Object Oriented Testing: OOT strategies and issues, Test Case design, interface testing.

Unit – IV

Software Maintenance and its types, S/w Configuration Management, S/w Reuse, Software Evolution, Software Quality Assurance: – plans & activities, concept, importance and essence; FTR, structured walk through technique etc., Software Documentation. Software Reliability, validation, Software Safety and Hazards Analysis; Features affecting software quality, SQA Plan. Using project management software tools, Quality management, issue, standards and

methods. ISO Quality models: ISO 9000 and SEI-CMM and their relevance.

References:

1. Pressman: Software Engineering, TMH.
2. Gill N.S. : Software Engineering, Khanna Book Publishing Co.(P) Ltd, N. Delhi.
3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
4. Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
5. Chhillar Rajender Singh: Software Engineering: Testing, Faults, Metrics, Excel Books, New Delhi.
6. Deutsch, Willis: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.

Learning Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

MCA-2201: DATA STRUCTURES & ALGORITHMS

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. The main objective of subject understands about algorithms writing and the fundamental approach of data structures to solving problems.
2. It helps to understand concepts about searching and sorting techniques as well as other data structure technique which are used to solve the particular problem using the basic concepts such as stacks, queues, lists, trees and graphs.

Unit – I

Definition, Classification of data structures, Operations on data structures, Design and analysis of algorithm, Top down and bottom up approaches to Algorithm design. Frequency count, Complexity. Arrays: Address calculation using column and row major ordering. Various operations on Arrays, Vectors, Application of arrays: Matrix multiplication, sparse polynomial representation and addition

Unit – II

Stacks and Queues: Introduction, Operations, Representation using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks. Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, doubly linked lists.

Unit-III

Binary tree traversal methods: Preorder, In-order, Post-ordered. Recursive Algorithms. Traversal methods. Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree: Height balanced (AVL) tree, B-trees. Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort, Heap sort, Radix sort and their complexity

Unit-IV

Searching, sorting and complexity, Hashing Schemes. Comparison of time complexity. Graph representation: Adjacency matrix, Adjacency lists, Depth first search, Breadth first search. Spanning tree: Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prim's and Kruskal's). File Structures: File Organization, Sequential Files, Indexing and Hashing,Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Refrences:

1. Hubbard JR: Schaum's outline of Data Structures with C++, TMH.
2. R. Sedgewick: Algorithms in C++, Pearson Education Asia.
3. Y.Langsam, M.J.Augenstein and A.M.Tanenbaum: Data Structures Using C and C++, Prentice Hall of India.
4. R.Kruse, C.L.Tonodo and B.Leung: Data Structures and Program Design in C, Pearson Education.
5. S.Chottopadhyay, D.Ghoshdastidar & M.Chottopadhyay: Data Structures Through 'C' Language, BPB Publication.
6. G.L. Heileman: Data Structutes, Algorithms and Object Oriented Programming, Tata McGraw Hill.
7. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++, Galgotia Publiction.

Learning Outcomes:

1. Ability to analyze algorithms and aalgorithm correctness.
2. Ability to summarize searching and sorting techniques.
3. Ability to describe stack,queue and linked list operation.
4. Ability to have knowledge of treeand graphs concepts.

MCA-2202: DATA BASE DESIGNING CONCEPTS

Max. Marks: 80

Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. Database Management Systems, provides an introduction to the students about management of database systems.
2. This course will emphasize on the understanding of the fundamentals of relational systems including data models, architectures, and manipulations.
3. It will also cover an understanding of new developments trends such as Internet database environment and data warehousing as well as a problem-based approach to learning.

Unit-I

Introduction to Database, features, Applications, data base System Vs. File Processing System, Instances and Schemas. Data Models – Hierarchical, Network, Relational Model. Database Access for applications Programs – data base Users and Administrator, Data Independence, Data base System Architecture. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, and Conceptual Design for Large enterprises.

Unit-II

Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Destroying /altering Tables and Views. Relational Algebra and Calculus: Relational Algebra, Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews, Query Processor, Codd's 12 Rules. Relational calculus–Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

Unit-III

Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries Set, Comparison Operators, NULL values, Comparison using Null **values, Logical connectivity's –** AND, OR and NOT. Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases. Database Languages – DDL, DML, DCL and Its commands. Schema refinement, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Normalization: FIRST to FIFTH Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies.

Unit-IV

Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking,

Introduction to Crash recovery. Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with DeadLocks, Specialized Locking Techniques.

References:

1. Raghurama Krishnan: Data base Management Systems, Johannes Gehrke, Tata McGrawHill Latest Edition.
2. Silberschatz, Korth: Data base System Concepts, McGraw Hill, latest edition.
3. P. Radha Krishna: Database Management Systems, HI-TECH Publications.
4. C.J.Date: Introduction to Database Systems, Pearson Education.
5. Gupta,S.B., Aditya Mittal, Introduction to Data base Management System, University Science Press, New Delhi.
6. Elmasri Navrate: Data base Management System, Pearson Education.

Learning Outcomes:

1. Understand database concepts and structures and query language
2. Understand the E R model and relational model
3. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
4. Understand Functional Dependency and Functional Decomposition.
5. Apply various Normalization techniques
6. Execute various advance SQL queries related to Transaction Processing & Locking using concept of Concurrency control.
7. Understand query processing and techniques involved in query optimization.

MCA-2203: ARTIFICIAL INTELLIGENCE

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. This subject will develop a basic understanding of the building blocks of AI and want working of intelligent agents: Search, Knowledge representation, inference, logic, and learning. Students will implement a small AI system in a team environment.
2. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

Unit – I

Introduction and applications of artificial intelligence, Problem solving: Defining the Problem as state space search, Production system, Problem characteristics, Problem System characteristics, Search techniques: Generate and test, Hill climbing, Best first search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.

Unit – II

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques, Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts. Propositional and Predicate logics, Propositional equivalence, Rules of Inference.

Unit – III

Perception: Sensing, Speech recognition, Vision, Action, Neural networks: Introduction, Comparison of artificial neural networks with biological neural networks, learning in neural networks, Perceptrons, Back propagation networks, application of neural networks.

Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller.

Unit – IV

Programming of Lisp: Background: history, installing, resources. Basics: symbols, evaluation, data types, lists, conditionals, functions, lambda forms, Emacs, REPL. Backquote, vectors,

sequences, file system, loop, format, packages, streams, debugger, compiling, Prolog in Lisp, knowledge representation, constraints, unification
Macros and Object: Macros, closures, reader macros, Error system, performance tuning, Type system, CLOS, Structs, FFI, OS hook, External libraries

Suggested Readings:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
3. Carl Townsend: Introduction to Turbo Prolog, BPB
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI
5. Satinder Bal Gupta: Artificial Intelligence, Shree Mahavir Book Depot(Publishers), New Delhi.
6. Practical Common Lisp (Peter Seibel) http://www.gigamonkeys.com/book/
7. Common Lisp –https://www.cs.cmu.edu/~dst/LispBook/book.pdf
8. On Lisp (Paul Graham) –http://www.paulgraham.com/onlisp.html

Learning Outcomes:

1. Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.
2. Demonstrate awareness of informed search and exploration methods.
3. Explain about AI techniques for knowledge representation, planning and uncertainty Management.
4. Develop knowledge of decision making and learning methods.
5. Describe the use of AI to solve English Communication problems.

MCA– 2204: THEORY OF COMPUTATION

Max Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. This subject is the base of the computer machine and the objective is to clear the concept of students regarding the designing and the working of the machine and computer system.
2. After studying this subject students are able to interpret the function of system as well as able to design new machine for the automation of system.

Unit-1

Finite State Systems, Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA , minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.
Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Conversion of Mealy to Moore machines and vice versa.

Unit-2

Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of regular expression, Regular expression conversion to Finite Automata and vice versa. Kleene Closure
Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

Unit-3

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal, Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form(CNF) and Greibach Normal Form(GNF),
Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

Unit-4

Turing machines: The basic model for Turing machines (TM), Deterministic and Non-Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by designed turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators. universal Turing machine, the universal and

diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages. Primitive Recursive Functions, Total Recursive Functions.

References:

1. Introduction to automata theory, language & computations-Hopcroaft & O.D. Ullman, R Mothwani, 2001, A.W.
2. Theory of Computer Sc. (Automata, Langugaes and computations):K.L.P.Mishra & N.Chandrasekaran, 2000PHI.
3. Introduction to formal Languages & Automata-Peter LinZ, 2001, Narosa Publ.
4. Fundamentals of the Theory of Computation-Principles and Practice By RamondGreenlaw and H.James Hoover, 1998, Harcourt India Pvt. Ltd.
5. Elements of theory of Computation by H.R.Lewis & C.H.Papaditriou, 1998,PHI.
6. Introduction to languages and the Theory of Computation by John C.Martin 2003, T.M.H.

Learning Outcomes:

- Model, compare and analyses different computational models using combinatorial methods.
- Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
- To solve various problems of applying normal form techniques, push down automata and Turing Machines.
- Identify limitations of some computational models and possible methods of proving them.
- Have an overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers.

MCA-2205: COMPUTER ORGANIZATION & ARCHITECTURE

Max. Marks: 80

Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning objectives:

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.
4. To explain the function of each element of a memory hierarchy,
5. To identify and compare different methods for computer I/O.

Unit-I

Basic organization of the computer and block level description of the functional units as related to the execution of a program. Operational concepts, Bus structures, Von Neumann Concept. Fetch, decode and execute cycle. Design of ALU: Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.

Unit-II

Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Hardwired controlled unit, Micro programmed controlled unit. General Register Organization, Stack Organization, Addressing Models, Data Transfer and Manipulation, RISC Vs. CISC architectures. Levels of programming languages, assembly language instructions, 8085 instruction set architecture Programming in Assembly Language for 8086/8088/80x6 micro-processor.

Unit-III

Input/Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct Memory Access, Input-output Processor, Serial Communication, Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Unit-IV

Parallel processing– Pipelining, Parallelism in unipolar systems, Architectural classification schemes. Principles of pipelining & Vector processing – Principles of Linear pipelining, General pipelines and reservation tables, interleaved memory Organizations, Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Vector processing Requirements. Structures for array processors: SIMD Array processor, SIMD Interconnection networks.

Refrences:

1. Mano, M.M.: Computer System Architecture, 3rd ed., Prentice-Hall of India.
2. Stallings, William: Computer Organisation & Architecture.
3. Gill, Nasib Singh and Dixit J.B: Digital Design and Computer Organisation, University Science
4. Press (Laxmi Publications), New Delhi.
5. Mano, M.M.: Digital Logic and Computer Design, Prentice-Hall of India.
6. Kai Hwang: Advanced Computer Architecture, McGraw Hill International

Learning Outcomes:

1. Describe the fundamental organization of a computer system
3. Explain the functional units of a processor
4. Distinguish the organization of various parts of a system memory hierarchy
5. Describe fundamentals concepts of pipeline and vector processing

MCA-2301: DATA WAREHOUSING & MINING

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

- The primary objective of the paper is the introduction of basic concepts of data warehouse, its key features and benefits of studying the paper in era of data science.
- Understanding design and development of data warehouse, data preprocessing and data analysis using data mining.
- Practical description of various techniques of data mining and their algorithms. Applicability of various mining methods for different purposes like classification, clustering, model building,prediction with their limitations and strength. The motive is to enhance the level of students to use various mathematical notations and statistical methods in algorithm writing and deciding which particular data mining technique is suitable to solve a particular problem.
- Introduction of multi-dimensional data analysis and practical implementation of various data mining software/ tools so that as an outcome, student after completing the course can easily apply the different methods for knowledge discovery, can learn advanced analytical methods for their career and easily select research problems as well as solutions using data mining tools.

Unit – I

Need for data warehouse, definition, goals of data warehouse, Data Mart, Data warehouse architecture, ETL process, star, snowflake and galaxy schemas for multidimensional databases, Designing fact tables. Partitioning.

Unit-II

OLTP vs OLAP technology, multidimensional data models and different OLAP operations, OLAP Server: ROLAP, MOLAP and HOLAP. Data cubes, efficient computation of data cubes, distributed and virtual data warehouse.

Unit-III

Data preprocessing, Data mining primitives, Types of Data Mining, Data Mining query language, Architectures of data mining. Data generation & Summarization based characterization, Mining class comparisons, Mining Association Rules in large databases: Association rule mining, single dimensional Bookan association rules from Transactional DBS, Multi level association rules from transaction DBS, multidimensional association rules. Correlation analysis, Constraint based association mining.

Unit-IV

Classification and Prediction: Classification by decision tree induction, Back propagation,

Bayesian classification, classification based in association rules, Prediction, Cluster analysis, partitioning and hierarchical methods, Density based method, web mining, Temporal and spatial data mining. Introduction to Data Mining tools: Rapid Miner, R-Programming, Orange Weka, Oracle BI, Advanced Miner.

References:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing,TMH.
5. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
7. A.K. Pujari: Data Mining Techniques, University Press.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
9. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.
10. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.

Learning Outcomes:

1. Understand the functionality of the various data mining and data warehousing component
2. Appreciate the strengths and limitations of various data mining and data warehousing models
3. Explain the analyzing techniques of various data
4. Describe different methodologies used in data mining and data ware housing.
5. Compare different approaches of data ware housing and data mining with various technologies

MCA-2302: Machine Learning and Data Analysis using Python

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

- Understanding the importance of Python in Machine Learning and Data analysis.
- Getting knowledge of Machine learning algorithms in Python.
- Develop the Python programming skills to solve computational problems.
- Make the students aware about the usefulness of various python packages as per the application requirements.
- Exploring the different ways of running Python.
- Teach the students to deal with real world data by importing data and performing various data analysis operations.
- Plotting the data for data visualization.

UNIT – I

Introduction to Python: History of Python, An interpreted high level language, Need of Python Programming, Applications, Importance in Data Science,

Introduction to Machine Learning: Definition of Machine Learning; Machine learning and AI, Use/Role of Python in AI, Importance of Python in AI and Machine learning. Applications of Machine Learning, Supervised vs. Unsupervised Learning, Python libraries suitable for Machine Learning; Overview of Python Libraries and Packages: Pillow, Matplotlib, Numpy, NLTK (Natural Language Toolkit), FlashText, Scipy, sklearn, Bokeh, Pandas, Mahotas.Pros & Cons of Machine Learning.

UNIT – II

Machine Learning Algorithms in Python; Advantages/Applications of machine learning Algorithms,Regression:Linear Regression, Non-linear Regression; Classification: K-Nearest Neighbour, Naive Bayes, Decision Trees, Logistic Regression, Support Vector Machines, Clustering: K-Means Clustering, Hierarchical Clustering, Density-Based Clustering, Recommender Systems: Content-based recommender systems, Collaborative Filtering; Role of Model evaluation.

UNIT - III

Installing and working with Python;Data Types, Operators and Operands in Python, Operator precedence; Expressions and Statements (Assignment statement); Input / Output and Comments in Python; **Data Structures:** Mutable or immutable objects in python; Lists, Tuples, Sets, Dictionaries; **Control structures:** Conditional Branching, Looping, Exception Handling; **User-defined functions:**Defining, invoking functions, passing parameters (default parameter values, keyword arguments), Scope of variables- Global and Local Variables, Void functionsand Fruitful Functions.

File Handling: File handling functions, Object Oriented concepts in Python: Classes in python: Creating a Class, The Self Variable, Constructor, Types of Variables, Namespaces; Inheritance: Types of Inheritance.

UNIT - IV

Data Science Using Python:downloading and reading data files in Python, Data Frame (Creating Data Frame from an Excel Spreadsheet, Creating Data Frame from .csv Files, Creating Data from Python List of Tuples, Operations on Data Frames);**Data Exploration:** head(), tail(), describe(),value_counts(),GroupBy();**Data Wrangling:** Check missing values in the dataset, Fill missing values, Binning in Python; **Data Visualization:** Bar Graph, Histogram, Creating a Pie Chart, Creating Line Graph.

References:

- *Jake VanderPlas:*Python Data Science Handbook.Publisher(s): O'Reilly Media, Inc. 2016. ISBN: 9781491912058.
- U Dinesh Kumar ManaranjanPradhan:Machine Learning using Python Paperback, Wiley, 2019
- AbhishekVijayvargia:Machine Learning with Python Language Paperback, BPB Pulications 2018.
- Kareem Alkaseer:Machine Learning & Big Data.
- Sebastian Raschka and VahidMirjalili:Python Machine Learning, Packt 2017. packtpub.com
- Andreas C. Mueller, Sarah Guido:Introduction to Machine Learning with Python Paperback, Kindle Edition, 2017.
- Wes Mckinney:Python for Data Analysis, 2e Paperback, Kindle Edition, 2017.
- https://docs.python.org/3/download.html
- https://docs.python.org/3/tutorial/index.html
- https://bugs.python.org/file47781/Tutorial_EDIT.pdf
- https://www.python.org/about/gettingstarted/
- https://www.tutorialspoint.com/python/index.htm

MCA-2303: SOFT COMPUTING

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective

Unit – I

Introduction: Introduction to soft computing; introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems.
Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

Unit-II

Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems. Neural Nets and applications of Neural Network.

Unit-III

Fuzzy systems and applications: fuzzy sets; fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems.
Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.

Unit-IV

Applications: Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Suggested Books:

1. M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
2. J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI, PearsonEducation.
3. Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
4. Davis E.Goldberg: Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley.
5. S. Rajasekaran and G.A.V.Pai: Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI.
6. D. E. Goldberg: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley.
7. Z. Michalewicz: Genetic Algorithms+ Data Structures = Evolution Programs, Springer-Verlag.
8. N.K. Sinha & M. M. Gupta(Eds): Soft Computing & Intelligent Systems: Theory & Applications, Academic Press.
9. M.T. Hagan, H. B. Demuth, And M. Beale: Neural Network Design, Thompson Learning.
10. G. J. Klir and T. A. Folger: Fuzzy Sets, Uncertainty, and Information, PHI.
11. A. Konar: Computational Intelligence Principles, Techniques and Applications, Springer.

12. Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka: Elements of Artificial Neural Networks, Penram, Mumbai.

Learning Outcomes:

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
2. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
3. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
4. Reveal different applications of these models to solve engineering and other problems.

MCA-2304: PRINCIPLES OF SYSTEMS PROGRAMMING & COMPILER DESIGN

Max. Marks: 80
Time: 3 Hrs.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

Learning Objectives:

1. Learn basic concepts of operating systems and system software's.
2. Design of operating systems and system software's.
3. Learn the functioning of the principal parts of an operating system.

Unit I

Evolution of the Components of Systems Programming: Assemblers, Loaders, Linkers, Macros, Compilers, Software Tools: Variety of software tools, Text editors, Interpreters and program generators, Debug Monitor, Programming environment, Loader schemes, compile and goloader, general loaderschemes, absolute loader, Subroutine Linkage, reallocating loader, Direct Linkage Loader, Binders, Linking loader, overlays.

Unit II

Compiler Structure: Compilers and translators need of translators, structure of compiler: itsdifferent phases, Compiler construction tools. Analysis-synthesis model of compilation.
Lexical analysis: Role of lexical analyzer, design of lexical analyzer, token, lexeme and patterns, regular expressions , Specification and recognition of tokens, input buffering, A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer

Syntax Analysis: Context free grammars, ambiguity, definition of parsing, shift reduce, operator precedence, top down parsing, recursive descent parsing, predictive parsing LL(1) grammar, Bottom up parsing, LR parsers (SLR, LALR, LR).

Unit III

Syntax directed definitions: Syntax directed definition, construction of syntax trees, Inherited and synthesized attributes, dependency graph, syntax directed translation scheme, and implementation of syntax directed translation, three address code, postfix notation, quadruples and triples.
Type checking: type system, type expressions, structural and name equivalence of types, type conversion, symbol table, data structure and implementation of symbol table, dynamic storage allocation. Intermediate code generation: intermediate representation, translation of declarations, assignments, Intermediate Code generation, Error, Lexical-phase errors, syntactic phase errors, semantic errors.

Unit IV

Code generation and instruction selection: Issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from DAGS, peep hole optimization, code generators.
Code optimization: source of optimizations, optimization of basic blocks, loops, code improving

transformations, data flow analysis of structured flow graphs.

Text Book:

1. K. C. Louden, "Compiler Construction, Principle and Practice" Thomson Books, 2006
2. Alfred V. Aho, Ravi Sethi & Jeffrey D. Ullman, "Compilers Principles, Techniques & Tools". Pearson, 1998.
3. S. S. Muchnick Harcourt Asra, "Advanced Compiler Design implementation", Morgan Kaufman, 2006.
4. Allen, "Modern Compiler Implementation in C", Cambridge Uty. Press 1997
5. Alan Holub, "Compiler Design in C", PHI, 2004.
6. Vinu V. Das, "Compiler Design using FLEX and YACC" PHI, 2005

Learning Outcomes:

1. Demonstrate the ability to think critically and analyze problems; find effective solutions to achieve desired objective.
2. Demonstrate the ability to analyze, design programs to demonstrate basic knowledge of systems software and operating systems.

Open Elective

(Provided by the Dept of Computer Science)

Paper MCA-Introduction to Computer

Max. Marks: 60.

Time: 3 Hrs.

Note: The examiner shall set nine questions in all covering the whole syllabus. Question No.1 will be compulsory covering all the units and shall carry 6 small questions of two marks each. The rest of the eight questions will be set from all the four units. The examiner will set two questions from each unit out of which the candidate shall attempt four questions selecting one question from each unit. All questions shall carry 12 marks each.

Learning Objectives:

1. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
2. Provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.
3. Provide foundational or "computer literacy" curriculum that prepares students for life-long learning of computer concepts and skills. Completion of course fulfills pre-requisite to enroll in other computer science courses required for a certificate, A.A. degree, transfer to the university or to qualify for highdemand employment.

Unit-I

Basic Concepts: What is computer, Characteristics of a Computer, Advantages of Computer, Limitations of Computer, Types of computer, Applications of computer, Data Representation, Hardware, firmware, Live-ware, Software: Relationship between hardware and software, System software: Operating system, Translators, Interpreter, Compiler, Assemblers, Linkers. Overview of operating system, Functions of operating system

Unit-II

Information Systems: Meaning, Need of an efficient Information system, Types of Information System. Information requirement for Planning, Coordination, and control for various levels in Business, Industry. Basic of data arrangement and access.

Introduction to database: Definition, Uses of databases, characteristics of database, DBMS, data independencies, difference between traditional file processing system and database approaches.

Unit-III

Net works: LAN, WAN. Wireless Network, Introduction networking, Importance of networking, Communication devices such as Modem, Features of Networking, Introduction to Internet: Meaning of Internet, Growth of Internet, Owner of Internet, Anatomy of Internet, Basic Internet Terminology, World Wide Web, Internet Protocols, Usage of Internet to society, Search Engines.

Unit-IV

Introduction to MS Word: Features of MS Word, component of word document window, creating and Printing a document, Formatting text and document, Mail Merge, Macro, Export and Import file, working with auto shapes, Adding pictures to a work document,

Introduction to MS Excel: Features of Excel, Creating a table, Formatting worksheet, Types of graph, Excel functions, Printing a worksheet, Managing and Organizing data. Power point presentation.

Learning Outcomes:

1. Utilize the Internet Web resources and evaluate on-line e-business system.
2. Solve common business problems using appropriate Information Technology applications and systems.
3. Identify categories of programs, system software and applications. Organize and work with files and folders.
4. Describe various types of networks network standards and communication software.

Paper MCA-Computer and Network Security

Max. Marks: 60.
Time: 3 Hrs.

Note: The examiner shall set nine questions in all covering the whole syllabus. Question No.1 will be compulsory covering all the units and shall carry 6 small questions of two marks each. The rest of the eight questions will be set from all the four units. The examiner will set two questions from each unit out of which the candidate shall attempt four questions selecting one question from each unit. All questions shall carry 12 marks each.

Learning Objectives:

1. Describe various communications networks and their main components.
2. Identify the advantages and disadvantages of a network.
3. Define the terminology associated with computer networks.
4. Identify the components associated with computer networks.
5. Develop a networking plan for yourself or a client.
6. Distinguish and explain the concepts of: hacking and cracking; authorization, and attacks.

Unit-I

The Security Problem in Computing: The meaning of Computer Security, Computer Criminals, Methods of Defense and Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms

Unit-II

Private Key Encryption, The Data Encryption Standard, The AES Encryption Algorithm, Public Key Encryptions, and Uses of Encryption RSA algorthims.

Unit-III

Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion DetectionSystems, Secure E-mail. Buffer Overflows, Software Security,Operating System Security,Trusted Computing and Multilevel Security.

Unit-IV

Privacy and ethical issues in networks, health issues in networked, Physical and Infrastructure Security, SecurityAuditing, Legal and Ethical Aspects, future of networked economy.

Learning Outcomes:

1. Analysis/Problem Solving and information literacy:
   a. Students develop a secure computer network plan.
   b. Students evaluate and recognize a problem as being a possible network security threat.
   c. Students need to understand the security issues involved with different Network operating systems.
2. Communications
   a. Students collect information from Computer network logs.
   b. Students formulate a complete and adequate counter measure plan and prepare against it.
   c. Students present their findings to the rest of the class.

1. Responsibility: Students are responsible for their own work.