# ADIKAVI NANNAYA UNIVERSITY

RAJAHMAHENDRAVARAM

UNIVERSITY COLLEGE OF ENGINEERING

# Course Structure &Syllabus

Department of Computer Science and Engineering

I MCA, I & II Semesters

(From the admitted batch of 2019 – 2020)

# ADIKAVI NANNAYA UNIVERSITY

RAJAHMAHENDRAVARAM

## UNIVERSITY COLLEGE OF ENGINEERING

Masters in Computer Applications (2019-20)
I MCA I & II Semester Course Structure and Syllabus

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# Adikavi Nannaya University

## Branch/Course: Master of Computer Applications

## Semester I (First Year) Curriculum

| Code | Course Title | Max Marks | | Total Marks | Hours per week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| **MCA-19101** | Discrete Mathematical Structures | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19102** | Management Accountancy | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19103** | C Programming & Data Structures | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19104** | Computer Organization | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19105** | Operating Systems | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19106** | C Programming & Data Structures Lab | 50 | 50 | 100 | - | 3 | 2 |
| **MCA-19107** | Operating Systems Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

# MCA-19101 DISCRETE MATHEMATICAL STRUCTURES

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

**UNIT I**

**Introduction:** Logic-Prepositional Equivalences-Truth tables-Totalogies-Predicates and Quantifiers-Sets-Operations on sets-Sequences and Summations -Growth functions - relations and their properties- n-ary relations and their applications - Representation of relations-Closures of relations-Equivalence relations-Partial Orderings.

**UNIT II**

**Counting Techniques:** Basics of Counting- Pigeonhole Principle- Combinations and Permutations-Generalized Permutations and Combinations

**Recurrence relations**: Solving Recurrence Relations-Divide and Conquer relations-Inclusion and Exclusion-Applications of Inclusion-Exclusion.

**UNIT III**

**Graphs:** Introduction to Graphs-Terminology-Relations and Directed Graphs Representations of Graphs- Isomorphism-Connectivity- Euler and Hamiltonian Paths- Shortest Path problems-Planar Graphs- Graph Coloring.

**Trees:** Introduction to trees- Applications of trees- Traversals-Trees and sorting Spanning Trees-Minimum Spanning Trees.

**UNIT IV**

**Boolean Algebra and Models of Computation:** Boolean Functions- Representing Boolean Functions -Logic Gates-Minimizations of Circuits-Languages and Grammars- Finite State Machines with and with no output.

**Text Book:**

Discrete mathematics and its applications, Keneth. H. Rosen, Tata McGraw-Hill Publishing Company, New Delhi

**Reference Books:**

1) Discrete Mathematics for computer scientists & Mathematicians, Joe L.Mott, Abraham Kandel & T. P. Baker,Prentice Hall of India Ltd, New Delhi

2) Discrete mathematics, Richard Johnsonbaug, Pearson Education, New Delhi

# MCA-19102 MANAGEMENT ACCOUNTANCY

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

**UNIT I**

Principles Of Accounting: Nature And Scope Of Accounting,Double Entry SystemOf accounting introduction To Basic Books Of Accounts Of Sole Proprietary Concern, closing of books of accounts and Preparation Of Trial Balance.

FinalAccounts: Trading,Profit And Loss Accounts And Balance Sheet Of Sole Proprietary Concern with Normal Closing Entries.(With numerical problems)

**UNIT II**

Ratio Analysis:Meaning, Advantages, Limitations, Types of Ratio and Their Usefulness. (Theory only)Fund Flow Statement: Meaning Of The Term Fund, Flow Of Fund, Working Capital Cycle, Preparation and Inter-preparation Of Statement.

**UNIT III**

Costing:Nature, Importance And Basic Principles. Budget and Budgetary Control: Nature And Scope, Importance, Method Of Finalization And Master Budget, Functional Budgets.

Marginal Costing:Nature,Scope, Importance,Construction Of Break Even Chart, Limitations And Uses Of Break Even Chart, Practical Applications Of Marginal Costing.(with numerical problems)

**UNIT IV**

Introduction To Computerized Accounting System: Coding Logic And Codes Required,Master Files, Transaction Files,Introduction To DocumentsUsed ForData Collection, Processing Of Different Files And Outputs Obtained.

**TEXTBOOKS:**

1. Introduction to Accountancy.T.S. Grewal.
2. Management Accountancy, S.P.Jain.

**REFERENCE BOOK:**

Introduction To Accounting,G.Agarwal.

# MCA-19103: C PROGRAMMING AND DATA STRUCTURES

**Theory : 4 Hrs** **Credits : 4**
**Int Marks : 25** **Ext Marks : 75**

**UNIT-I**

Introduction to Computers, Algorithm, flowchart, program development steps, Structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Control structures such as if, go to, labels, and switch statements. Loops- while, do-while and for statements, break, continue.

**UNIT-II**

Arrays - declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1- D arrays, 2-D arrays – 2-D and character arrays – Multidimensional arrays. **Functions:** basics, parameter passing, storage classes- scope rules, user defined functions, standard library functions, recursive functions, header files, C pre processor. **Pointers: C**oncepts, initialization of pointer variables, pointers and Function arguments, passing by address –dangling memory, Character pointer s and functions, pointer s to pointer s, pointer s and multidimensional arrays, dynamic memory managements functions, command line arguments.

**UNIT-III**

**Derived types:** structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typed of, bit-fields, Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations.

**Data Structures:** Introduction to Data Structures – Time Complexity –Space Complexity – Pattern matching – naive method – Robin Karp Algorithm .

**UNIT-IV**

**Searching** – Linear and binary search methods, sorting –Bubble sort, selection sort, Insertion sort, Quick sort, merge sort. Single linked lists, doubly linked lists, circular list, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation. Trees- Binary tress, terminology, representation, traversals, Graphs - terminology, representation, graph versals (dfs & bfs) –Warshalls – Dijkstra – Kruskal – Prims Algorithms.

**TEXT BOOKS:**

1.C and Data Structures: A snapshot oriented treatise using live engineering examples, N B Venkateswarlu, E. V Prasad, S Chand & Co.

2. Let Us C ,YashwantKanetkar, BPB Publications, 5th Edition.

3. Computer science, A structured programming approach using C, B.A. Forouzan and R.F.Gilberg, Third edition, Thomson.

**REFERENCE BOOKS:**

1. Fundamentals of Data Structures in C , Horowitz, Sahni, Anderson-Freed, 2nd ed, 2008.

2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson.

# MCA-19104 COMPUTER ORGANIZATION

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

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**UNIT-I**

**Digital Logic Circuits:**

Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuit, Flip-flops Sequential Circuits.

**Digital Components:**

Integrated Circuits, Decoders, Multiplexes, Registers, Shift Registers, counters, Memory Unit.

**UNIT-II**

**Data Representation:**

Data Types, Complements, Fixed-point Representation, Floating point Representation.

**Register Transfer and Micro Operations:**

Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Assembly language Instructions, 8085 Microprocessor Instruction Set Architecture.

**UNIT-III**

**Basic Computer Organization and Design:**

Instruction Codes, Computer Register, Computer Instructions, Timing and Control, Instruction Cycle memory reference Instructions, Input-Output, Interrupt.

**Central Processing Unit:**

Introduction, General Register Organization, Stack Organization, Instruction formats, addressing modes.

**UNIT-IV**

**Input /Output Organization:**

Peripherals Devices, I/O Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct memory access, Input – Output Processor(IOP).

**Memory Organization:**

Memory Hierarchy, Main memory, Auxiliary Memory, Associate Memory, Cache Memory and Virtual Memory.

**Text Books:**

1.Computer System Architecture, M.Morris Mano, Prentice Hall of India Pvt.ltd. Third Edition, Sept. 2008.

**Reference Books:**

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd. Eastern Economy Edition, Sixth Edition, 2003.
2. Computer System Architecture John P. Hayes.
3. Computer Architecture A Quantitative approach 3rd Edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elseveir)

# MCA-19105 OPERATING SYSTEMS

**Instruction: 4 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total: 100 Marks**

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**UNIT I**

**Introduction:** Definition of Operating System, Types Of Operating Systems, Operating System Structures, Operating-System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

**Process Management**: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple - Processor Scheduling. Thread Scheduling.

**UNIT II**

**Process Synchronization:** The Critical Section Problem, Semaphores, And Classical Problems of Synchronization, Critical Regions, Monitors, Synchronization examples.

**Deadlocks**: Principles of Deadlocks, System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection & Recovery from Deadlocks.

**UNIT III**

**Memory Management:** Logical Versus Physical Address, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing

**File System Implementation:** Concept of a file, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers.

**Mass-storage structure:** overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

**UNIT IV**

**Protection:** Goals and Principles of Protection, Access matrix implementation, Access control, Revocation of access rights.

**Case study:** LINUX, Windows Operating Systems.

**Text Book:**

1. Operating System Principles by Abraham Silberschatz, Peter Galvin, Greg Gagne.
Seventh Edition, Wiley Publication

**Reference Books:**

1. Operating Systems, William Stallings 5th Edition - PHI
2. Modern Operating Systems, Andrew S.Tanenbaum, , 2nd edition, 1995, PHI.
3. Operating Systems - A concept based approach, Dhamdhere, 2nd Edition, TMH, 2006.
4. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition,' Reilly, 2005.

## MCA-19106: C PROGRAMMING AND DATA STRUCTURES LAB

**Lab: 3 Hrs.** **Credits : 2**

**Int Marks :50** **Ext Marks: 50**

1. Write a C program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line.
2. Write a C program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).
3. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
4. Write a C program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.
5. Write a C function for transporting a square matrix in place (in place means that you are not allowed to have full temporary matrix).
6. Write a C function which will invert a matrix.
7. Write a set of string manipulation functions eg. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.
8. Write a C program for sorting a list using Bubble sort and then apply binary search.
9. Write a C program to implement the operations on stacks.
10. Write a C program to implement the operations on circular queues.
11. Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials.
12. Write a C program for quick sort.
13. Write a C program for Merge sort.
14. Write a C program to create a binary search tree and for implementing the in order, preorder, Post order traversal using recursion.
15. Write a C program for finding the Depth First Search of a graph.
16. Write a C program for finding the Breadth First Search of a graph.

**REFERENCE BOOKS:**


1. Let Us C ,YashwantKanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI
4. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
5. Classic Data Structures, 2/e, Debasis ,Samanta,PHI,2009
6. Fundamentals of Data Structure in C, 2/e, Horowitz,Sahni, Anderson Freed,University

# MCA-19107 OPERATING SYSTEMS LAB

**Practical: 3 Periods /week** **Time: 3 Hours** **Credits: 2**
**Internal: 50 Marks** **External: 50 Marks** **Total: 100 Marks**

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**List of Experiments:**

1. Basic UNIX commands

**Implement the following using Shell Programming**

2. Input number even or odd
3. Count the number of lines in the input text
4. Print the pattern

```
*
***
*****
```

5. File encryption

**Implement the following using C/C++/JAVA**

6. FCFS CPU scheduling algorithm
7. SJF CPU scheduling algorithm
8. Round Robin CPU scheduling algorithm
9. Priority CPU scheduling algorithm
10. Implement Semaphores
11. Sequential file allocation strategy
12. Indexed file allocation strategy
13. Bankers Algorithm for Dead Lock Avoidance
14. Algorithm for Dead Lock Detection
15. FIFO Page Replacement Algorithm
16. LRU Page Replacement Algorithm
17. LFU Page Replacement Algorithm

**REFERENCE BOOKS:**

1. Operating System Principles by Abraham Silberschatz, Peter Galvin, Greg Gagne. Seventh Edition, Wiley Publication
2. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition, Reilly, 2005.
3. Unix programming, Stevens, Pearson Education.
4. Shell programming, Yashwanth Kanetkar.

# Adikavi Nannaya University

## Branch/Course: Master of Computer Applications

## Semester II (First Year) Curriculum

| Code | Course Title | Max Marks | | Total Marks | Hours per week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| **MCA-19201** | Probability Statistics and Queuing Theory | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19202** | Information Systems and Organizational Behavior | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19203** | Object Oriented Programming through JAVA | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19204** | Formal Languages and Automata Theory | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19205** | Web Technologies | 75 | 25 | 100 | 4 | - | 4 |
| **MCA-19206** | Object Oriented Programming through JAVA Lab | 50 | 50 | 100 | - | 3 | 2 |
| **MCA-19207** | Web Technologies Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

# MCA-19201 PROBABILITY, STATISTICS & QUEUING THEORY

**Instruction: 4 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total: 100 Marks**

**UNIT I:**

**Probability:** Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes' Theorem of Probability.

**Random variables and their properties:** Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.

**UNIT II:**

**Probability Distributions:** Discrete Distributions**:** Binomial, Poisson and Their Properties; Continuous Distributions**:** Uniform, Normal, Exponential Distributions and Their Properties. **Multivariate Analysis**: Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Attributes, Coefficient of Association, Chisquare – Test For Goodness Of Fit, Test For Independence.

**UNIT III:**

**Estimation**: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. **Testing of Hypothesis**: Formulation of Null hypothesis, critic al region, level of significance, power of the test;

**UNIT IV:**

**Sample Tests:** Small Sample Tests: Testing equality of means, testing equality of variances, Large Sample tests : Tests based on normal distribution

**Queuing Theory**: Queue description, characteristics of a queuing model, study state solutions of M/M/1:∞ Model, M/M/1 : N Model,

**TEXT BOOKS** :

1. Probability & Statistics for Engineers and Scientists,Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

**REFERENCE BOOK:**

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Triv edi, Prentice Hall of India ,1999

## MCA-19202 INFORMATION SYSTEMS & ORGANIZATIONAL BEHAVIOUR

**Instruction: 3 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total: 100 Marks**

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**UNIT I**

**Organization Structure**: Features of Good Organization Structures, Designing of Organization Structure, Types of Organization Structures- Functional, Product, Geographic and Matrix Organization Structures

**UNIT II**

**Motivation:** Nature and importance of motivation, Theories of motivation – Maslow's, Herzberg's and Mc Gregor's X and Y Theories of Motivation. Leadership: Meaning and definition, Importance of Leadership, Leadership styles, Communication: Process of Communication, Importance, Forms of Communication and Barriers in Communication.

**UNIT III**

**Group Dynamics**: Types of Groups, Stages of Group Development, Group Behavior and Group Performance Factors. Organizational Conflicts: Reasons for Conflicts, Consequences of Conflicts in Organizations, Types of Conflict, Strategies for Managing Conflicts, Organizational Climate and Culture.

**UNIT IV**

**Management Information System**: Nature and Scope, Characteristics and Functions. Classification of MIS - Transaction Processing System, Management Information System, Decision Support System, Executive Support System, Office Automation System and Business Expert System.

**TEXT BOOKS:**

1. Elements of Organizational Behavior, Robbins, 7th Edition, Pearson Education
2. Management Information Systems – D.P.Goyal, Macmillan Publishers India Ltd.

**REFERENCE BOOKS:**

1. Organizational Behaviour – L.M.Prasad, Sultan Chand and sons
2. Management Information Systems - L.M.Prasad, Usha Prasad , Sultan Chand and sons
3. Management Information Systems – Kanter Jerma , PHI

# MCA-19203 Object Oriented Programming through JAVA

**Instruction: 4 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total:100 Marks**

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**UNIT I**

**Introduction to OOP** :Introduction, Principles of Object Oriented Languages, Applications of OOP, Programming Constructs: Variables, Primitive Datatypes, Identifiers- Naming Coventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive TypeConversion and Casting, Flow of control- Branching, Conditional, loops. Classes and Objects- classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, cleaning up unused objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments.

**Inheritance**: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class.

**UNIT II**

**Interfaces, Packages and Enumeration**: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package. **Exceptions & Assertions** – Introduction, Exception handling techniques- try… catch, throw, throws, finally block, user defined exception, Exception Encapsulation and Enrichment, Assertions.

**UNIT III**

**MultiThreading**: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading- Using isAlive () and join (), Syncronization, suspending and Resuming threads, Communication between Threads Input/Output: reading and writing data, java.io package, **Applets**– Applet class, Applet structure, An Example Applet Program, Applet : Life Cycle, paint(), update() and repaint(),

**UNIT IV**

**Event Handling** -Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.

**Abstract Window Toolkit** :Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar, **Swing**: Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScroll Pane, Split Pane, JTabbedPane, Dialog Box Pluggable Look and Feel.

**Text Books:**

1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
2. Programming in JAVA, Sachin Malhotra, Saurabh choudhary, Oxford.

**References:**

1. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.\
2. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson.

# MCA-19204 FORMAL LANGUAGES & AUTOMATA THEORY

**Instruction: 4 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total: 100 Marks**

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**UNIT-I**

**Finite Automata and Regular Expressions**: Basic Concepts of Finite State Systems, Chomsky Hierarchy of Languages, Deterministic and Non-Deterministic Finite Automata, Finite Automata with $\epsilon$-moves, Regular Expressions.

**Regular sets &Regular Grammars**: Basic Definitions of Formal Languages and Grammars, Regular Sets and Regular Grammars, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Decision Algorithm for Regular Sets, Minimization of Finite Automata.

**UNIT-II**

**Context Free Grammars and Languages**: Context Free Grammars and Languages, Derivation Trees, simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL's.

**Push down Automata**: Informal Description, Definitions, Push-Down Automata and Context free Languages, Parsing and Push-Down Automata.

**UNIT-III**

**Turing Machines**: The Definition of Turing Machine, Design and Techniques for Construction of Turing Machines, Combining Turing Machines.

**Universal Turing Machines and Undecidability**: Universal Turing Machines. The Halting Problem, Decidable & Undecidable Problems - Post Correspondence Problem.

**UNIT-IV**

**The Propositional calculus**: The Prepositional Calculus : Introduction – Syntax of the Prepositional Calculus – Truth-Assignments – Validity and Satisfiability – Equivalence and Normal Forms – resolution in Prepositional Calculus.

**The Predicate calculus**: Syntax of the Predicate Calculate Calculus – Structures and Satisfiability – Equivalence – Un-solvability and NP-Completeness.

**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson Education Asia.

2. Elements of The Theory Of Computation, Harry R Lewis, Cristos h. Papadimitriou, Pearson Education / Prentice-Hall of India Private Limited.

**REFERENCE BOOKS:**

1. Introduction to languages and theory of computation – John C. Martin (MGH)

2. Theory of Computation, KLP Mishra and N. Chandra Sekhar, IV th Edition, PHI

3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)

# MCA-19205 WEB TECHNOLOGIES

**Instruction: 4 Periods/week** **Time: 3 Hours** **Credits: 4**
**Internal: 25 Marks** **External: 75 Marks** **Total: 100 Marks**

**UNIT I**

**Networking Protocols and OSI Model:** Protocols in Computer Communications, the OSI Model, OSI Layer Functions

**Internetworking Concepts, Devices, Basics, History and Architecture:** Internetworking, Problems in Internetworking, Dealing with Incompatibility Issues, A Virtual Network, Internetworking Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet, Internet topology, Internal Architecture of an ISP

**TCP/IP Part I** (Introduction to TCP/IP, IP, ARP, RARP, ICMP):TCP/IP Basics, Why IP Addresses? Logical Addresses,TCP/IP Example The Concept of IP Address, Address Resolution Protocol (ARP), Reverse ARP, Internet Control Message Protocol (ICMP), Datagram, Fragmentation and Reassembly

**UNIT II**

**TCP/IP Part II** (TCP, UDP):Basics of TCP, Features of TCP, Relationship between TCP and IP, Ports and Sockets, Connections-Passive Open and Active Open, TCP connections, What Makes TCP Reliable? TCP Packet Format, Persistent TCP Connections, User Datagram Protocol , UDP Packet, Difference between UDP and TCP

**TCP/IP Part III** (DNS, Email, FTP, TFTP): Domain Name System (DNS), Electronic Mail (Email), File Transfer Protocol (FTP)**,** Trivial File Transfer Protocol (TFTP)

**TCP/IP Part IV** (WWW, HTTP, TELNET): A Brief History of WWW, Basics of WWW and Browsing, Locating Information on the Internet, HTML , Web Browser Architecture, Web Pages and Multimedia, Remote Login (TELNET).

**An Introduction to Electronic Commerce:** Aspects of Electronic Commerce, Types of E Commerce, Approaches for Developing E Commerce Solutions, Electronic Procurement, Phases in a Procurement Process, E-Procurement Models, E-Procurement Solutions, Trading Models, Buyer Side Purchasing, Supply Chain Management (SCM) and Customer Relationship Management (CRM)

**UNIT III**

**Introduction to Web Technology:** Features Required for Enabling e-commerce, Web pages-Types and Issues, Tiers, The Concept of a Tier, A Concept of Microsoft and Java Technologies, Web Pages, Static Web Pages, Plug-ins, Introduction to Frames and Forms

**Dynamic Web Pages:** Need for Dynamic Web Pages,Magic of Dynamic Web Pages, Overview of Dynamic Web Page Technologies, Overview of Dynamic HTML (DHTML), Common Gateway Interface (CGI), Microsoft's Active Server Pages (ASP), Basics of ASP Technology, ASP Example, Modern Trends in ASP, Java and the Concept a Virtual Machine, Java Servlets and Java Sever pages(JSP), Java Servlets, Java Sever pages (JSP).

**Active Web pages:**Active Web pages is a Better Solution, Java Applets, Why are Active Web Pages Powerful? When not to use Active Web Pages, Lifecycle of Java Applets, Java Beans, Active X Controls.

**UNIT IV**

**Middleware and Component-based E-commerce Architectures:**CORBA, Java Remote Method Invocation (RMI), Microsoft's Distributed Component Object Model

**Electronic Data Interchange** (EDI): An Overview of EDI, the Origins of EDI, Understanding EDI, Data Exchange Standards, EDI Architecture, The Significance of EDI in International Trade, Financial EDI, EDI and the Internet.

**Extensible Markup Language** (XML): Standard Generalized Markup Language (SGML), Basics of XML, XML parsers, The Need for a Standard.

**Wireless Application Protocol** (WAP):Limitations of Mobile Devices, The emergence of WAP, WAP Architecture, The WAP Stack, Concerns about WAP and its Future, Alternatives to WAP.

**Text Book:**

Web Technologies: TCP/IP to Internet Application Architectures-TATA McGraw Hill Publications – Achyut S Godbole, Atul Kahate

## MCA-19206 Object Oriented Programming through JAVA Lab

**Instruction: 3 Periods/week** **Time: 3 Hours** **Credits: 2**
**Internal: 50 Marks** **External: 50 Marks** **Total:100 Marks**

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1. a) Write A Java Program to print Quadratic roots using command line arguments.

   b) Write a java program to print multiplication table using arrays.

2. Write a java program to find the volume of a Box using method overloading with different number of parameters.

3. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. If Num1 or Num2 is not an integer, the program would throw a Number Format Exception. If Num2 is Zero, program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

6. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.

7. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

8. Write a java package for book class and then import and display the result.

9. Write a Java program to illustrate the multiple inheritance by using Interfaces.

10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

**TEXT BOOKS**

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

# MCA-19207 WEB TECHNOLOGIES LAB

| | | |
|---|---|---|
| **Instruction: 3 Periods/week** | **Time: 3 Hours** | **Credits: 2** |
| **Internal: 50 Marks** | **External: 50 Marks** | **Total: 100 Marks** |

**List of Experiments:**

1. Create web pages for an application demonstrating the working of different features of HTML and DHTML.
2. Demonstrate the use of CSS in organizing the layout of webpages

**Implement at least two Java Script programs to demonstrate the working of**

3. Conditional statements
4. Looping statements.
5. Arrays
6. Functions.
7. Event handling
8. Validation controls.

**Develop simple applications for the following**

9. Exercise client server programming using Java Script, Servlets, ASP, JSP
10. Create a web application with database connectivity and work on different queries for data manipulation.

**REFERENCES:**


1. Web Technologies, Godbole, Kahate, 2nd Ed., TMH
2. Internet & World Wide Web How to program, Dietel & Deitel Fourth Edition, PHI
3. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech
4. The complete Reference HTML and DHTML, Thomas A. Powey
5. Core Servlets and Java Server Pages, Marty Hall Larry Brown, Second Edition

# ADIKAVI NANNAYA UNIVERSITY

UNIVERSITY COLLEGE OF ENGINEERING
RAJAMAHENDRAVARAM

Department of Computer Science and Engineering

# MCA

## Syllabus
## & Model Question Papers

## II & III Year

**Board of Studies**
University College of Engineering

**ADIKAVI NANNAYA UNIVERSITY:: RAJAMAHENDRAVARAM**
**UNIVERSITY COLLEGE OF ENGINEERING**
**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**
**MASTERS IN COMPUTER APPLICATIONS (AB 2019-20)**

# COURSE STRUCTURE

## Semester III (Second Year) Curriculum

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA-19301 | Operations Research | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19302 | Design and Analysis of Algorithms | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19303 | Computer Networks | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19304 | Artificial Intelligence and Expert systems | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19305 | Database Management System | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19306 | Computer Networks Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19307 | Database Management System Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

## Semester IV (Second Year Curriculum)

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA -19401 | Information Security and Cryptography | 75 | 25 | 100 | 4 | - | 4 |
| MCA- 19402 | Cloud Computing | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19403 | Data Mining Concepts and Techniques | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19404 | Object Oriented Software Engineering | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19405 | Elective-I<br>1.Distributed Systems<br>2.Internet of Things<br>3.Image Processing | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19406 | Data Mining Concepts and Techniques Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19407 | Object Oriented Analysis and Design Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

## Semester V (Third Year) Curriculum

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA-19501 | Big Data Analytics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19502 | Cyber Security and Forensics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19503 | Elective II<br>1. Blockchain Technology<br>2. Foundations of Data Science<br>3. Human-Computer Interaction | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19504 | Elective-III<br>1.Python Programming<br>2.Pearl Programming<br>3.PHP programming | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19505 | Elective-IV<br>1.Machine Learning<br>2.Embedded Systems<br>3.Robotics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19506 | Big Data Analytics Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19507 | Mini Project | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

## Semester VI (Third Year) Curriculum

| code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA -19601 | Project | | | | | - | 16 |

# Branch/Course: Master of Computer Applications

**Semester III (Second Year) Curriculum**

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA-19301 | Operations Research | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19302 | Design and Analysis of Algorithms | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19303 | Computer Networks | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19304 | Artificial Intelligence and Expert systems | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19305 | Database Management System | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19306 | Computer Networks Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19307 | Database Management System Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

**Course Code &Title: MCA-19301 OPERATIONS RESEARCH**
**Semester & Year of study: III & 2020-2021**
**Course Index: C301**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about Operations Research and Linear Programming. |
| To learn about the concept of Dual problems and Transportation Model. |
| To learn about Network Models, Integer Programming, Dynamic Programming. |
| To learn about the concept of Deterministic Inventory Models, Game theory. |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C301.1 | Understand Operations Research and Linear Programming. |
| C301.2 | Understand the concept of Dual problems and Transportation Model. |
| C301.3 | Understand about Network Models, Integer Programming, Dynamic Programming. |
| C301.4 | Understand the concept of Deterministic Inventory Models, Game theory. |

## MCA-19301 OPERATIONS RESEARCH

| | | |
|---|---|---|
| **Instruction:4 Periods/week** | **Time: 3 Hours** | **Credits:4** |
| **Internal:25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

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### UNIT I

**Overview of Operations Research:** OR models – OR Techniques

**Linear Programming**: Introduction – Graphical solution; Graphical sensitivity analysis- The standard form of linear programming problems – Basic feasible solutions- unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.

### UNIT II

**Dual Problems:** Relation between primal and dual problems – Dual simplex method

**Transportation Model:**Starting solutions, North West corner Rule - lowest cost method, Vogels approximation method – Transportation algorithms – Assignment problem – Hungarian Method.

### UNIT-III

**Network Models:** Definitions – CPM and PERT – Their Algorithms

**Integer Programming**: Branch and Bound Algorithms cutting plan algorithm.

**Dynamic Programming:** Recursive nature of dynamic programming – Forward and Backward Recursion

### UNIT-IV

**Deterministic Inventory Models:** Static EOQ Models – Dynamic EOQ models.

**Game theory:** Two person Zero Sum Games – Mixed strategy games and their Algorithms.

**Text Books:**

1. Operations Research – An Introduction, Handy A Taha – Pearson Education.
2. Operations Research Panneer Selvan Prentice Hall of India.

**Reference Books:**

1. Operations Research, SD Sharma
2. Operations Research Kanti Swaroop, PK Gupta, Man Mohan – Sultan Chand & Sons Education

**Course Code &Title: MCA-19302 DESIGN AND ANALYSIS OF ALGORITHMS**
**Semester & Year of study: III & 2020-2021**
**Course Index: C302**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the Asymptotic Notations, Mathematical Analysis of Non-recursive and recursive Algorithms and sorting techniques. |
| To learn about the Divide-and-Conquer technique, Decrease-and-Conquer and Transform-and-Conquer techniques. |
| To learn about the Dynamic Programming and Greedy Technique |
| To learn about the Decision Trees, P, NP and NP- complete problems, Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems. |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C302.1** | Understand about the Asymptotic Notations, Mathematical Analysis of Non-recursive and recursive Algorithms and<br>Selection Sort and Bubble sort, Sequential Search and Exhaustive Search. |
| **C302.2** | Understand about the Divide-and-Conquer technique, Decrease-and-Conquer and Transform-and-Conquer techniques. |
| **C302.3** | Understand the Optimal Binary Search Trees, The Knapsack Problem<br>Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm. |
| **C302.4** | Understand about the Decision Trees, P, NP and NP- complete problems, Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems. |

## MCA-19302 DESIGN AND ANALYSIS OF ALGORITHMS

| | | |
|---|---|---|
| **Instruction:4Periods/week** | **Time: 3Hours** | **Credits:4** |
| **Internal:25Marks** | **External:75Marks** | **Total: 100Marks** |

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### UNIT I

**Introduction:** Fundamentals of algorithmic problem solving, important problem types, fundamental data structures.

**Fundamentals of analysis of algorithms and efficiency:** Analysis framework, Asymptotic Notations and Basic Efficiency classes, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of recursive Algorithms, Empirical Analysis of Algorithms, Algorithm Visualization.

**Brute Force:** Selection Sort and Bubble sort, Sequential Search and Exhaustive Search.

### UNIT II

**Divide-and-Conquer:** Merge Sort, Quick sort, Binary Search, Binary Tree Traversals and Related Properties.

**Decrease-and-Conquer:** Insertion Sort, Depth-First Search and Breadth-First Search-Topological Sorting, Decrease-by-a-Constant-Factor Algorithms, Variable-Size-Decrease Algorithms.

**Transform-and-Conquer:** Presorting, Balanced Search Trees, Heaps and Heap sort, Problem Reduction.

### UNIT III

**Space and Time Tradeoffs**: Sorting by Counting, Hashing, B-Trees.

**Dynamic Programming:** Warshall's and Floyd's Algorithm, Optimal Binary Search Trees, The Knapsack Problem and Memory Functions.

**Greedy Technique:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees

### UNIT IV

**Limitations of Algorithm Power:** Lower-Bound Arguments, Decision Trees, P, NP and NP-complete problems.

**Coping with the Limitations of Algorithms Power**: Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems.

**Text Book:**


1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003


**Reference Books:**


1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ron ald R. Rivest& Clifford Stein, Prentice Hall of India, NewDelhi.
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft & Ullman, Pearson Education, New Delhi, 2003
3. Fundamentals of algorithmics, Gilles Brassard & Paul Bratley, Prentice Hall of India, NewDelhi

**Course Code &Title: MCA-19303 COMPUTER NETWORKS**
**Semester & Year of study: III & 2020-2021**
**Course Index: C303**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the basics of computer networks and Data Communication. |
| To learn about Data Link Layer, IEEE Standards, design issues in networks. |
| To learn about Internet Transport Protocols and different types of protocols. |
| To learn about various types of Network Devices and different types of Networks |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C303.1** | Understand the basics of computer networks and Data Communication. |
| **C303.2** | Understand about Data Link Layer, IEEE Standards, design issues in networks. |
| **C303.3** | Understand Internet Transport Protocols and different types of protocols. |
| **C303.4** | Overview of various types of Network Devices and different types of Networks |

## MCA-19303 COMPUTER NETWORKS

| | | |
|---|---|---|
| **Instruction:4Hrs/week** | **Time:3 Hours** | **Credits:4** |
| **Internal:25Marks** | **External:75Marks** | **Total: 100Marks** |

### UNIT I

**Introduction to Computer Networks:** Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

**Data Communications:** Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Networks

### UNIT II

Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.

**Design Issues in Networks:** Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

### UNIT III

**Internet Transport Protocols:** Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

### UNIT IV

**Network Devices:** Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks

**Text Books:**


1. Computer Networks, Andrews S Tanenbaum, Edition 5, PHI, ISBN: -81-203-1165-5
2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill Co Ltd, Second Edition


**Reference Books:**


1. Computer networks, Mayank Dave,Cengage.
2. Computer Networks, A System Approach, 5th ed, Larry L Peterson and Bruce S Davie,Elsevier.
3. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4. Understanding Communications and Networks, 3rd Edition, W.A. Shay, Thomson.

**Course Code &Title: MCA-19304 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**
**Semester & Year of study: III & 2020-2021**
**Course Index: C304**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the basic concept of Artificial Intelligence. |
| To learn about the algorithms and logics in Artificial Intelligence. |
| To learn about the theories and functions related to Artificial Intelligence. |
| To learn about the concept, characteristics and applications of Expert Systems. |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C304.1** | Understand the basic concept of Artificial Intelligence. |
| **C304.2** | Understand the algorithms and logics in Artificial Intelligence. |
| **C304.3** | Understand about the theories and functions related to Artificial Intelligence. |
| **C304.4** | Understanding the concept, characteristics and applications of Expert Systems. |

## MCA-19304 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

**Instruction:4Periods/week** **Time:3Hours** **Credits: 4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

What is AI, The Foundations of AI, The History of AI, Agents and Environments, The Concept of Rationality, The Nature of Environments, The Structure of Agents, Problem Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies: Breadth First, Depth First, Depth Limited; Informed Search Strategies: Greedy Best First, A* Algorithms

### UNIT II

Heuristic Functions, Local-Search Algorithms and Optimization Problems: Hill Climbing, Simulated Annealing, Genetic Algorithms; Constraint Satisfaction Problems, Backtracking Search For CSPs, Games, Optimal Decisions in Games

Knowledge Based Agents, The Wumpus World, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, Syntax and Semantics of First Order Logic, Using First Order Logic, Inference in First-Order Logic: Unification, Resolution.

### UNIT III

Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distribution, Independence, Bayes Rule and Its Use, Other Approaches To Uncertain Reasoning: Dempster Shafer Theory, Fuzzy Sets and Fuzzy Logic

Combining Beliefs Under Uncertainty, The Basis of Utility Theory, Utility Functions, Multi Attribute Utility Functions, Decision Theoretic Expert Systems

### UNIT IV

Expert System, Concepts and Characteristics, Applications and Domains of Expert System, Elements of an Expert System, Stages in the Development of an Expert System, Semantic Nets, Frames

Speech Recognition, Forms of Learning, Inductive Learning, Learning Decision Trees, Single Layer Feed Forward, Multi-Layer Feed Forward Neural Networks.

**Text Books:**


1. Artificial Intelligence: A Modern Approach. Stuart Russell, Peter Norvig, Pearson Education 2nd Edition.
2. Expert Systems: Principles and Programming. Joseph C Giarratano, Gary D Riley Thomson Publication, 4thEdition.


**Reference Books:**


1. Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGrawHill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.
3. David W Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill.

**Course Code &Title: MCA-19305 DATABASE MANAGEMENT SYSTEMS**
**Semester & Year of study: III & 2020-2021**
**Course Index: C305**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the Introduction of Database System, Data Modeling Using the Entity-Relationship Model |
| To learn about Relational Data Model and Relational Database Constraints, Relational Algebra and Relational Calculus, Schema Definition, Basic Constraints and Queries |
| To learn about Relational Database Design, Indexing Structures for files |
| To learn about Transaction Processing, Concurrency Control Techniques |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C305.1** | Able to understand the Introduction of Database System, Data Modeling Using the Entity-Relationship Model |
| **C305.2** | Able to understand Relational Data Model and Relational Database Constraints, Relational Algebra and Relational Calculus, Schema Definition, Basic Constraints and Queries |
| **C305.3** | Able to understand Relational Database Design, Indexing Structures for files |
| **C305.4** | Able to understand Transaction Processing, Concurrency Control Techniques |

## MCA-19305 DATABASE MANAGEMENT SYSTEMS

**Instruction:4Periods/week** **Time:3 Hours** **Credits:4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

**Database and Database Users:** Data models, schemas, and instances, three-schemas architecture and data independence, database languages and interfaces, the database system environment, Centralized and client/ server architectures for DBMSs, Classification of database management system.

**Data Modeling Using the Entity-Relationship Model:** Using High—Level Conceptual data model, Entity types, entity sets Attributes and keys, Relationships types, relationship sets, roles and structural constraints, Weak Entity types, ER diagrams Meaning conventions and design issues, Enhance Entity Relationship model,

**Relational data model and relational database constraints:** Relational model constraints and relational schemas, update operations.

### UNIT II

**Relational Algebra and Relational Calculus**: Unary Relational operations, Relational Algebra operations, Binary Relational operation, Additional Relational operation, Examples of Queries in Relational Algebra, Domain Relational Calculus.

**Relational database design by ER and EER Relational Mapping:** Relational database design using ER to Relational Mapping, Mapping EER Model Construct to Relations, **Schema Definition, Basic Constraints and Queries:** SQL Data definition, Specifying basic constraints in SQL, Schema change Statements in SQL, Basic queries in SQL, More complex SQL queries, INSERT DELETE UPDATE queries in SQL, Views in SQL, Data base stored Procedures

### UNIT III

**Relational Database Design**: Informal design Guide lines for Relation Schema, Functional Dependences, Normal forms based on Primary keys, General definitions of Second and Third Normal form, BOYCE-CODE Normal form, Algorithm for Relational database schema design, Multi-valued dependencies and fourth Normal forms,

**File Organization and Indexes:** Introduction, Secondary Storage Devices, Buffering Blocks, placing file records on disk, Operations on Files, Hashing Techniques, Parallelizing Disk Access using RAID Technology, Indexing Structures for files.

### UNIT IV

**Algorithm for query processing and Optimization**: Translating SQL Queries into Relational Algebra, Algorithms for SELECT and JOIN Operations, Algorithms for PROJECT and SET Operations,

**Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Process, Transaction and System Concepts, Characterizing Schedules, Concurrency Control Techniques, Database Recovery Concepts, Recovery Techniques.

**Text Book:**

1. Fundamentals of Database System, Elmasri, Navathe, Pearson Education.

**References Books**:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw- Hill.
2. Database Concepts, Abraham Silberschatz ,Henry FKorth, SSudarshan, McGraw-Hill

**Course Code &Title: MCA-19306 COMPUTER NETWORKS LAB**
**Semester & Year of study: III & 2020-2021**
**Course Index: C306**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| Learn how to implement data framing methods |
| Learn how to implement error detecting techniques |
| Learn how to implement routing algorithms |
| Learn how to implement security encryption algorithms |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C306.1** | Able to implement data framing methods |
| **C306.2** | Able to implement error detecting techniques |
| **C306.3** | Able to implement routing algorithms |
| **C306.4** | Able to implement security encryption algorithms |

## MCA-19306 COMPUTER NETWORKS LAB

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**
**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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1. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP 15.
3. Implement Dijkstra‘s algorithm to compute the Shortest Path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table for each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Take a 64 bit playing text and encrypt the same using DES algorithm.
7. Write a program to break the above DES coding.
8. Using RSA algorithm encrypts a text data and Decrypt the same.

**Text Books:**

1. Computer Networks, Andrews S Tanenbaum, Edition 4, PHI.

2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill CoLtd, Second Edition.

**Course Code &Title: MCA-19307 DATABASE MANAGEMENT SYSTEMS LAB**
**Semester & Year of study: III & 2020-2021**
**Course Index: C307**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| Learn how to write SQL queries using DDL, DML, DCL commands |
| Learn how to write SQL queries on aggregate and conversion functions |
| Learn how to write PL/SQL programs on exception handling, control structures |
| Learn how to write PL/SQL programs on cursors, procedures, triggers. |

**Course Outcomes:**
By the end of the course, the student will be

| | |
|---|---|
| **C307.1** | Able to write SQL queries using DDL, DML, DCL commands |
| **C307.2** | Able to write SQL queries on aggregate and conversion functions |
| **C307.3** | Able to write PL/SQL programs on exception handling, control structures |
| **C307.4** | Able to write PL/SQL programs on cursors, procedures, triggers. |

## MCA-19307 DATABASE MANAGEMENT SYSTEMS LAB

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**
**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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**SQL**

1) Simple queries to understand DDL, DML and DCLcommands
2) Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
3) Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
4) Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
5) Queries using Conversion functions like (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions like (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char,to_date)

**PL/SQL**

1) Simple programs to understand PL/SQL
2) Write a PL/SQL program to demonstrate exception–handling
3) Demonstrate the working of COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
4) Develop a program that includes the features NESTED IF, CASE and CASE expression.
5) Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.
6) Programs using CURSORS
7) Programs development using creation of procedures and functions.
8) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers

**Text Books:**


1. Oracle Database 11g, Jason Price, Oracle Press
2. Oracle PL/SQL for Dummies, Michael Rosenblum, Paul Dorsey, Wiley Publications.

## Semester IV(Second Year Curriculum)

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA -19401 | Information Security and Cryptography | 75 | 25 | 100 | 4 | - | 4 |
| MCA- 19402 | Cloud Computing | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19403 | Data Mining Concepts and Techniques | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19404 | Object Oriented Software Engineering | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19405 | Elective-I<br>1.Distributed Systems<br>2.Internet of Things<br>3.Image Processing | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19406 | Data Mining Concepts and Techniques Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19407 | Object Oriented Analysis and Design Lab | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

**Course Code &Title: MCA-19401 INFORMATION SECURITY AND CRYPTOGRAPHY**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C401**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the security approaches and techniques, Introduction to number theory |
| To learn about Symmetric key and Asymmetric key cryptographic algorithms |
| To learn about User Authentication Mechanisms ,System security |
| To learn about Internet Security Protocols and Network Security |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C401.1 | Able to understand the security approaches and techniques, Introduction to number theory |
| C401.2 | Able to Symmetric key and Asymmetric key cryptographic algorithms |
| C401.3 | Able to understand the User Authentication Mechanisms ,System security |
| C401.4 | Able to understand the Internet Security Protocols and Network Security |

## MCA-19401 INFORMATION SECURITY AND CRYPTOGRAPHY

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits:4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT I

**Introduction:** The need for security-security approaches-principles of security-Plain Text and Cipher Text-substitution and Transposition Techniques-Encryption and Decryption-Symmetric and Asymmetric Cryptography-Stenography-key range and key size-types of attacks.

**Number Theory:** Introduction to number theory- Modular Arithmetic, Euclidean algorithm, Euler theorem, Fermat Theorem, Totient Function, Multiplicative and Additive Inverse.

### UNIT II

**Symmetric Key Cryptographic Algorithms:** Algorithm types and modes-overview of symmetric key cryptography – DES – IDEA – Blowfish – AES-Differential and Linear Cryptanalysis.

**Asymmetric Key Cryptographic Algorithms:** Overview of asymmetric key cryptography-RSA algorithm-symmetric and asymmetric key cryptography together-digital signatures.

### UNIT III

**User Authentication Mechanisms**: Introduction-Authentication basics – passwords-authentication tokens-certificate based authentication-biometrics authentication-Hash functions-SHA1.

**System Security**: Intruders, Viruses, Related Threats, Trusted Systems.

### UNIT IV

**Internet Security Protocols:** Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET- 3D secure protocol-Electronic money-Email security-WAP security-security in GSM.

**Network Security:** Brief Introduction to TCP/IP -Firewalls -IP security-Virtual Private Networks.

**Text Books:**


1. Cryptography and Network security, Atul Kahate, Tata McGraw-Hill Pub company Ltd., New Delhi
2. Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi


**Reference Books:**


1. Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi
2. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes - Ousley, Keith Strass berg Tata McGraw-Hill.

**Course Code &Title: MCA- 19402 CLOUD COMPUTING**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C402**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing |
| To learn about the Hardware and Infrastructure , Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration |
| To learn about Developing the Applications like Google, Microsoft, Intuit QuickBase, Local Clients and thin clients |
| To learn about Migrating the Cloud, Cloud Services |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C402.1 | Able to understand about the Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing |
| C402.2 | Able to understand about the Hardware and Infrastructure , Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration |
| C402.3 | Able to understand about Developing the Applications like Google, Microsoft, Intuit QuickBase, Local Clients and thin clients |
| C402.4 | Able to understand about the Migrating the Cloud, Cloud Services |

## MCA- 19402 CLOUD COMPUTING

**Instruction:4Periods/week** **Time:3Hours** **Credits: 4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

**Cloud Computing Basics** - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

**Organization and Cloud Computing** - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBM Partnerships.

### UNIT II

**Hardware and Infrastructure** - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs,Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.

**Software as a Service** - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

### UNIT III

**Developing Applications** - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

**Local Clouds and Thin Clients** - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.

### UNIT IV

**Migrating to the Cloud** - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

**Text Books:**

1. Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.

**Reference Books:**

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MKElsevier.
2. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press

**Course Code &Title: MCA-19403 DATA MINING CONCEPTS AND TECHNIQUES**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C403**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing |
| To learn about the Introduction to Data Mining , Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity |
| To learn about the Concept Description, Generalization by AOI , Mining Frequent Patterns, Associations and Correlations, Mining Frequent Itemset |
| To learn about the Basic Concepts of Classification ,Different Methods of Classification |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C403.1 | Able to understand about the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing |
| C403.2 | Able to understand about the Introduction to Data Mining , Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity |
| C403.3 | Able to understand about the Concept Description, Generalization by AOI , Mining Frequent Patterns, Associations and Correlations, Mining Frequent Item set |
| C403.4 | Able to understand about the Basic Concepts of Classification ,Different Methods of Classification |

## MCA-19403 DATA MINING CONCEPTS AND TECHNIQUES

**Instruction:4Periods/week Time:3Hours Credits: 4**
**Internal:25Marks External:75Marks Total: 100Marks**

### UNIT I

Data Warehouse and OLAP Technology: An overview Data Warehouse Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Implementation Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, From Data Warehousing to Data Mining

### UNIT II

Introduction to Data Mining: Motivation and importance, what is Data Mining, Data Mining on what kind of data, what kinds of patterns can be mined, which technologies are used, which kinds of applications are targeted, Major issues in Data Mining. Getting to know your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity

### UNIT III

Concept Description: Characterization and comparison What is Concept Description, Data Generalization by Attribute-Oriented Induction(AOI), AOI for Data Characterization, Efficient Implementation of AOI, AOI for Class comparisons. Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori method, generating Association Rules, Improving the Efficiency of Apriori, Pattern-Growth Approach for mining Frequent Item sets, Mining Frequent Itemsets using vertical data format, Mining Closed and Max Patterns.

### UNIT IV

Classification Basic Concepts: Basic Concepts, Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Bayes Classification Methods, Classification by Back Propagation, Support Vector Machines. Cluster Analysis: Cluster Analysis, Partitioning Methods, Hierarchal methods, Density based methods-DBSCAN and OPTICS.

**Text Book:**

1. Data Mining Concepts and Techniques—JiaweiHan, Micheline Kamber and Jian Pei, Morgan Kaufman Publications 3rd edition.

**Reference Books:**

1. Introduction to Data Mining –Pang-Ning Tan, Michael Steinbach, Vipin Kumar
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K.Pujari, University Press

**Course Code &Title: MCA-19404 OBJECT ORIENTED SOFTWARE ENGINEERING**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C404**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about Introduction to Object Oriented Software Engineering, Object Orientation, Requirements Engineering |
| To learn about the Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams |
| To learn about the Software Design , Architecture and Design Patterns |
| To learn about the Software Testing, Software Project Management, Software Process Models |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C404.1 | Able to understand about the Introduction to Object Oriented Software Engineering, Object Orientation, Requirements Engineering |
| C404.2 | Able to understand about the Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams |
| C404.3 | Able to understand about the Software Design and Architecture, Design Patterns |
| C404.4 | Able to understand about the Software Testing, Software Project Management, Software Process Models |

## MCA-19404 OBJECT ORIENTED SOFTWARE ENGINEERING

**Instruction:4Periods/week** **Time: 3Hours** **Credits:4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

**Introduction to Object Oriented Software Engineering:** Nature of the Software, Types of Software, Software Engineering Activities, Software Quality

**Introduction to Object Orientation:** Data Abstraction, Inheritance & Polymorphism, Reusability in Software Engineering, Examples: Postal Codes, Geometric Points.

**Requirements Engineering:** Domain Analysis, Problem Definition and Scope, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing Requirements, Case Studies: GPS based Automobile Navigation System, Simple Chat Instant Messaging System.

### UNIT II

**Unified Modeling Language & Use Case Modeling:** Introduction to UML, Modeling Concepts, Types of UML Diagrams with Examples; User-Centered Design, Characteristics of Users, Developing Use Case Models of Systems, Use Case Diagram, Use Case Descriptions, The Basics of User Interface Design, Usability Principles.

**Class Design and Class Diagrams**: Essentials of UML Class Diagrams, Associations and Multiplicity, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Process of Developing Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

### UNIT III

**Software Design and Architecture:** Design Process, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document, Software Architecture, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns.

**Design Patterns:** Abstraction-Occurrence, General Hierarchical, Play-Role, Singleton, Observer, Delegation, Adaptor, Façade, Immutable, Read-Only Interface and Proxy Patterns.

### UNIT IV

**Software Testing:** Effective and Efficient Testing, Defects in Ordinary Algorithms, Numerical Algorithms, Timing and Co-ordination, Stress and Unusual Situations, Testing Strategies for Large Systems.

**Software Project Management:** Introduction to Software Project Management, Activities of Software Project Management, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

**Software Process Models:** Waterfall Model, The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model, Rational Unified Process.

**Text Book:**

1. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill

**Reference Books:**

1. The Unified Modeling Language User Guide. Grady Booch,James Rumbaugh and Ivar Jacobson.Addison-Wesley.
2. Software Engineering; A Practitioner's Approach. Roger SPressman.
3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson EducationAsi

**Course Code &Title: MCA-19405 DISTRIBUTED SYSTEMS (ELECTIVE I)**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C405**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about Introduction to Distributed Systems: Goals, Design Issues, Hardware Concepts |
| To learn about the Communication in distributed systems, Client-server model, Clock synchronization Algorithms |
| To learn about the Processes and Processors, Threads , System models, Distributed File Systems |
| To learn about the Distributed Shared Memory**,** Consistency Models, Page based distributed shared memory, Synchronization |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C405.1 | Able to understand about the Introduction to Distributed Systems: Goals, Design Issues, Hardware Concepts |
| C405.2 | Able to understand about the Communication in distributed systems, Client-server model, Clock synchronization Algorithms |
| C405.3 | Able to understand about the Processes and Processors, Threads , System models, Distributed File Systems |
| C405.4 | Able to understand about the Distributed Shared Memory**,** Consistency Models, Page based distributed shared memory, Synchronization |

## MCA-19405 DISTRIBUTED SYSTEMS (ELECTIVE I)

**Instruction:4Periods/week** **Time: 3Hours** **Credits:4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

**Introduction to Distributed Systems:** Distributed systems: Goals, Hardware Concepts: Bus Multiprocessor Timesharing Systems, Design Issues: Reliability, Performance, Scalability etc.

### UNIT II

**Communication distributed systems:** ATM Networks: Asynchronous Transfer Mode, The ATM Physical Layer, The ATM Layer, The ATM Adaptation Layer, ATM Switching, Applications of ATM for DS, Client-server model: Clients and Servers, Addressing, Blocking versus Nonblocking Primitives, Buffered versus Unbuffered Primitives, Reliable versus Unreliable Primitives, Implementing the Client-Server Model. Remote procedure call:RPC Operation, RPC semantics in the presence of Failures, Implementation issues.

**Synchronization:** Clock synchronization: Logical Clocks, Physical Clocks, Clock Synchronization Algorithms, Use of Synchronized Clocks, Mutual exclusion: Centralized Algorithm, Distributed Algorithm, Token Ring Algorithm, Comparison of the Three Algorithms, Election Algorithms: The Bully Algorithm, A Ring Algorithm, Atomic Transactions: Introduction, The Transaction Model, Implementation, concurrency Control, Dead locks.

### UNIT III

**Processes and Processors:** Threads: Introduction, Thread Usage, Design Issues for Thread packages, implementing a Thread Package, Threads and RPC, System models: The Workstation Model, The Processor pool model, A hybrid model, Processor allocation – Scheduling in Distributed Systems, Fault tolerance: Component Faults, System failures, Real time distributed systems: Design Issues, Real Time Communication, Real Time Scheduling.

**Distributed file systems:** Distributed File system design: File Service Interface, Directory Server interface, File System Implementation: File Usage, System Structure, Caching, Replication.

### UNIT IV

**Distributed Shared Memory:** Introduction, Bus based multi processors, Ring based multiprocessors, Switched multiprocessors, Comparison of shared memory Systems, Consistency Models: Strict Consistency, Sequential Consistency, Causal Consistency, PRAM Consistency and Processor Consistency, Weak Consistency, Release Consistency, Entry Consistency, Page based distributed shared memory: Replication, Granularity, Achieving Sequential Consistency, Finding the owner, finding copies, page replacement, Synchronization.

**Text Book:**

1. Andrew S. Tanenbaum: Distributed Operating System, Prentice Hall Intl Inc. 1995.

**Reference Book:**

1. Distributed Systems – Concepts and Design, George Coulouris, Jean Dollimore, Tim Kindberg, Pearson Education.

**Course Code &Title: MCA-19405 INTERNET OF THINGS (ELECTIVE I)**
**Semester & Year of study: IV & 2020-202**
**Course Index: C405**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs |
| To learn about the IOT & M2M, SNMP |
| To learn about the IoT Platforms Design Methodology |
| To learn about the IoT Physical Devices & Endpoints |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C405.1 | Able to understand about the Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs |
| C405.2 | Able to understand about the IOT & M2M, SNMP |
| C405.3 | Able to understand about the IoT Platforms Design Methodology |
| C405.4 | Able to understand about the IoT Physical Devices & Endpoints |

**MCA-19405 INTERNET OF THINGS (ELECTIVE I)**

**Instruction:4Periods/week** **Time:3Hours** **Credits: 4**

**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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**UNIT-I**

**Introduction to Internet of Things:** Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle

**UNIT-II**

**IOT & M2M:** Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, 1 Need for IoT Systems Management, Simple Network Management Protocol (SNMP) , Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG,NETOPEER

**UNIT-III**

**IoT Platforms Design Methodology:** IoT Design Methodology, Case Study on IoT System for Weather Monitoring , Motivation for Using Python , IoT Systems - Logical Design using Python ,Installing Python , Python Data Types & Data Structures ,Control Flow , Functions, Modules, Packages , File Handling l, Date/Time Operations , Classes ,Python Packages of Interest for IoT

**UNIT-IV**

**IoT Physical Devices & Endpoints:** Raspberry Pi , About the Board , Linux on Raspberry Pi , Raspberry Pi Interfaces , Programming Raspberry Pi with Python , Other IoT Devices, IoT Physical Servers & Cloud Offerings , Introduction to Cloud Storage Models & Communication APIs , WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework - Django , Designing a RESTful Web API , Amazon Web Services for ,SkyNet IoT Messaging Platform

**Text Book:**

1. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

**Reference Book:**

1. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012

**Course Code &Title: MCA-19405 IMAGE PROCESSING (ELECTIVE I)**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C405**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the Fundamentals of Image Processing, Basics of Histogram , Definition and Algorithm of Histogram Equalization |
| To learn about the Image Transforms**:** A Detail Discussion On Fourier Transform, DFT,FFT, Image Enhancement |
| To learn about the EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters, Image Compression |
| To learn about the Image Segmentation, Morphology |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C405.1 | Able to understand about the Fundamentals of Image Processing, Basics of Histogram , Definition and Algorithm of Histogram Equalization |
| C405.2 | Able to understand about the Image Transforms**:** A Detail Discussion On Fourier Transform, DFT,FFT, Image Enhancement |
| C405.3 | Able to understand about the EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters, Image Compression |
| C405.4 | Able to understand about the Image Segmentation, Morphology |

## MCA-19405 IMAGE PROCESSING (ELECTIVE I)

**Instruction:4Periods/week** **Time:3Hours** **Credits: 4**
**Internal:25Marks** **External:75Marks** **Total: 100Marks**

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### UNIT I

**Fundamentals of Image Processing:** Image Acquisition, Image Model, Sampling, Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film.

**Histogram:** Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

### UNIT II

**Image Transforms:** A Detail Discussion On Fourier Transform, DFT, FFT,

**Image Enhancement:**

a) Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations,
b) Smoothing Filters-Mean, Median, Mode Filters – Comparative Study
c) Edge Enhancement Filters – Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity
d) Low Pass Filters, High Pass Filters, Sharpening Filters. – Comparative Study

### UNIT III

**Image Enhancement:** Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

**Image Compression:** Run Length Encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:-Image Compression Standards.

### UNIT IV

**Image Segmentation:** Characteristics of Segmentation, Detection of Discontinuities, Thresholding Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Motion in Segmentation.

**Morphology:** Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images, Application of Morphology inIP

**Text Book:**

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addison Wesley

**Reference Books:**

1. Fundamentals of Electronic Image Processing By Arthyr– R – Weeks, Jr.(PHI)
2. Image Processing, Analysis, And Machine Vision by Milan Sonka Vaclan Halava Roger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan & T. Veera Kumar,TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, Wiley-Blackwell

**Course Code &Title: MCA-19406 DATA MINING CONCEPTS AND TECHNIQUES LAB**
**Semester & Year of study: IV & 2020-2021**
**Course Index: C406**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about the aware of usage of few packages, functions and libraries of R |
| To learn about the basic R commands, Interact data, Clean Data, Visualize statistical measures, data frame |
| To learn about how to Apply group of functions, rbind, cbind and some more libraries |
| To learn about the K-medoids and density based clustering, decision trees |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C406.1 | Able to aware of usage of few packages, functions and libraries of R |
| C406.2 | Able to implement basic R commands, Interact data, Clean Data, Visualize statistical measures, data frame |
| C406.3 | Able to implement Apply group of functions, rbind,cbind and some more libraries |
| C406.4 | Able to implement K-medoids and density based clustering, decision trees |

## MCA-19406 DATA MINING CONCEPTS AND TECHNIQUES LAB

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**
**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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Students should be aware of usage of few packages and libraries of R. They should also be familiar with few functions used in R for visualization.

1. Implement all basic R commands
2. Interact data through .csv files (Import from and export to .csv files).
3. Get and Clean data using swirl exercises. (Use 'swirl' package, library and install that topic from swirl).
4. Visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure.

| EMP ID | EMP NAME | SALARY | START DATE |
|---|---|---|---|
| 1 | Satish | 5000 | 01-11-2013 |
| 2 | Vani | 7500 | 05-06-2011 |
| 3 | Ramesh | 10000 | 21-09-1999 |
| 4 | Praveen | 9500 | 13-09-2005 |
| 5 | Pallavi | 4500 | 23-10-2000 |

a. Extract two column names using column name.
b. Extract the first two rows and then all columns.
c. Extract 3rd and 5th row with 2nd and 4th column.

6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
    i. 0 to 1 range with min-max normalization.
    ii. a value around 0 with z-score normalization.
7. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8. Create a function to discretize a numeric variable into 3 quantiles and label them as low, medium, and high. Apply it on each attribute of iris dataset to create a new data frame. 'discrete_iris' with Categorical variables and the class label.
9. Create a simple scatter plot using toothgrowth dataset using 'dplyr' library. Use the same data to indicate distribution densities using boxwhiskers.
10. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best $R^2$ and plot the original values in 'green' and predicted values in 'red'.
11. Write R Programs to implement k-means clustering, k-medoids clustering and density based clustering on iris dataset.
12. Write a R Program to implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.

References:

1. www.tutorialspoint.com/r
2. www.r-tutor.com
3. R and Data Mining: Examples and Case Studies Yanchang Zhao.

**Course Code &Title: MCA-19407 OBJECT ORIENTED SOFTWARE ENGINEERING LAB**
**Semester & Year of study :IV & 2020-2021**
**Course Index: C407**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn how to specify, visualize, construct and document the artifacts of software systems. |
| To learn how to use Rational Rose Enterprise Edition for modeling |
| To learn about the Software Project Management and Software Engineering activities to specify customized according to the features of the project. |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C407.1 | Able to understand how to specify, visualize, construct and document the artifacts of software systems |
| C407.2 | Able to understand how to use Rational Rose Enterprise Edition for modelling |
| C407.3 | Software Project Management and Software Engineering activities specified can be customized according to the features of the project. |

## MCA-19407 OBJECT ORIENTED SOFTWARE ENGINEERING LAB

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**
**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing and documenting the artifacts of software systems. The primary goal of UML is to provide users a ready-to-use, expressive visual modeling language so that they can develop and exchange meaningful models.

This lab deals with object oriented analysis and design of a software problem using UML concepts and notations. The tool used is Rational Rose Enterprise Edition. Any other open source tool is also recommended.

**Document the Software Project Management and Software Engineering activities for any two of the following projects. Any other project of interest also can be chosen.**

1. Student Result Management System
2. Library Management System
3. Payroll System
4. Bank Loan System
5. Railway Reservation System
6. Automatic Teller Machine
7. Hostel Management System
8. Hospital Management System
9. Online Shopping System
10. Blood Bank Management System
11. GPS
12. Journal Publication System
13. Chatroom Application
14. Social Media Application

**Software Project Management and Software Engineering activities specified below can be customized according to the features of the project.**

- Problem Statement
- Feasibility Study
- Software Requirements Specification Document
- Estimation of Project Metrics
- Entity Relationship Diagram
- Use Case Diagrams
- Class Diagram
- Sequence Diagrams
- Activity Diagrams
- State Chart Diagrams
- Test coverage

References:

1. The Unified Modeling Language User Guide. Grady Booch,James Rumbaugh and Ivar Jacobson. Addison-Wesley.
2. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill

## Semester V (Third Year) Curriculum

| Code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA-19501 | Big Data Analytics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19502 | Cyber Security and Forensics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19503 | Elective II<br>1. Blockchain Technology<br>2. Foundations of Data Science<br>3. Human-Computer Interaction | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19504 | Elective-III<br>1.Python Programming<br>2.Pearl Programming<br>3.PHP programming | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19505 | Elective-IV<br>1.Machine Learning<br>2.Embedded Systems<br>3.Robotics | 75 | 25 | 100 | 4 | - | 4 |
| MCA-19506 | Big Data Analytics Lab | 50 | 50 | 100 | - | 3 | 2 |
| MCA-19507 | Mini Project | 50 | 50 | 100 | - | 3 | 2 |
| | Total Credits | | | | | | 24 |

**Course Code &Title: MCA-19501 BIG DATA ANALYTICS**
**Semester & Year of study: V & 2021-2022**
**Course Index: C501**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about introduction to Big Data and Hadoop |
| To learn about Real Time Analytics, Map Reduce Programming |
| To learn about Streaming in Spark, Machine Learning, Map Reduce Advanced Programming |
| To learn about Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C501.1 | Understand about introduction to Big Data and Hadoop |
| C501.2 | Understand about Real Time Analytics, Map Reduce Programming |
| C501.3 | Understand about Streaming in Spark, Machine Learning, Map Reduce Advanced Programming |
| C501.4 | Understand about Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview |

## MCA-19501 BIG DATA ANALYTICS

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT I

**Data structures in Java**: Java concepts required for developing Map Reduce Programs: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.
**Introduction to Big Data:** Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop[Zikopoulos]

### UNIT II

**Introduction to Hadoop:** Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker
**HDFS:** Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File system, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives.

### UNIT III

**MapReduce Programming:** Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, counting things, Adapting for Hadoop's API changes, Streaming in Hadoop.
**MapReduce Advanced Programming:** Advanced MapReduce - Chaining Map Reduce jobs, joining data from different sources.

### UNIT IV

**Graph Representation in MapReduce:** Modeling data and solving problems with graphs,Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filters.

**Text Books:**


1. Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data by Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, 1st Edition, TMH,2012.
2. Hadoop in Action by Chuck Lam, MANNING Publishers.
3. Hadoop in Practice by Alex Holmes, MANNING Publishers


**Reference Books:**


1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Big Java Fourth Edition Cay Horstmann Wiley, John Wiley &Sons
3. Mining of massive datasets, AnandRajaraman, Jeffrey D Ullman, Wiley Publications.

**Course Code &Title: MCA-19502 CYBER SECURITY AND FORENSICS**
**Semester & Year of study: V & 2021-2022**
**Course Index: C502**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about information security and Threats, Data Leakage |
| To learn about Cyber Security Introduction, Cyber Security Evolution |
| To learn about Cyber Security Objectives, Guidance for Decision Makers, Cyber Governance Issues |
| To learn about Cyber User Issues, Cyber Conflict Issues, Cyber Management Issues, Cyber Infrastructural Issues |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C502.1 | Understand about information security and Threats, Data Leakage |
| C502.2 | Understand about Cyber Security Introduction, Cyber Security Evolution |
| C502.3 | Understand about Cyber Security Objectives, Guidance for Decision Makers, Cyber Governance Issues |
| C502.4 | Understand about Cyber User Issues, Cyber Conflict Issues, Cyber Management Issues, Cyber Infrastructural Issues |

## MCA-19502 CYBER SECURITY AND FORENSICS

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT – I

**Information Security and Threats:** Information Security, Information Assets, Threats to Information Assets

**Fundamentals of Information Security:** Elements of information security, Principles and concepts – data security, Types of controls

### UNIT – II

**Data Leakage**: Introduction – Data Leakage, Organizational Data Classification, Location and Pathways, Content Awareness, Content Analysis Techniques, Data Protection, DLP Limitations, DRM-DLP Conundrum.

**Information Security Policies, Procedures, Standards and Guidelines**: Information Security Policies, Key Elements of a Security Policy, Security Standards, Guidelines and Frameworks, Laws, Regulations and Guidelines

### UNIT – III

**Information Security Performance Metrics**: Introduction – Security Metrics, Types of Security Metrics, Using Security Metrics, Developing the Metrics Process, Metrics and Reporting, Designing Information Security Measuring Systems

**Risk Assessment:** Risk Overview, Risk Identification, Risk Analysis, Risk Treatment, Risk Management Feedback Loops, Risk Monitoring

**Log Correlation and Management:** Event Log Concepts, Log Management and its need Log Management Process, Configuring Windows Event Log, IIS Log Files, Analysis and Response

**Data Backup:** Data Backup, Types of Backup, Backup Procedures, Types of Storage, Features of a Good Backup Strategy

### UNIT – IV

**Computer Forensics Analysis and Validation:** Determining What Data to Collect and Analyze-Validating Forensic Data-Addressing Data-Hiding Techniques- Performing Remote Acquisitions.

**E-mail Investigations:** Exploring the Role of E-mail in Investigations- Exploring the Roles of the Client and Server in E-mail- Investigating E-mail Crimes and Violations- Understanding E-mail Servers-Using Specialized E-mail Forensics Tools.

**Cell Phone and Mobile Device Forensics:** Understanding Mobile Device Forensics-Understanding Acquisition Procedures for Cell Phones and Mobile Devices.

Text Books:


1. NASSCOM, Handbook of Security Analyst, SSC/Q0901,2015.
2. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph WeissCyber Security Policy Guidebook, John Wiley & Sons2012.


Reference Books:


1. Rick Howard, Cyber Security Essentials, Auerbach Publications2011.
2. Richard A. Clarke, Robert Knake, Cyberwar: The Next Threat to National Security &What to Do About It, Ecco2010.
3. Dan Shoemaker Cyber security The Essential Body of Knowledge, 1st ed. Cengage Learning2011.
4. Augastine, Paul T., Cyber Crimes and Legal Issues", Crecent Publishing Corporation,2007.

**Course Code &Title: MCA-195033 BLOCK CHAIN TECHNOLOGIES (ELECTIVE II)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C503**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about introduction to Block Chain, Basic Distributed System Concepts |
| To learn about Cryptography in Blockchain, Cryptography algorithms |
| To learn about Bitcoin-Cryptography, Hyperledger Fabric |
| To learn about Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry trcords and blockchain in IoT |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C503.1 | Understand about introduction to Block Chain, Basic Distributed System Concepts |
| C503.2 | Understand about Cryptography in Blockchain, Cryptography algorithms |
| C50.3 | Understand about Bitcoin-Cryptography, Hyperledger Fabric |
| C503.4 | Understand about Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry trcords and blockchain in IoT |

## MCA-19503 BLOCKCHAIN TECHNOLOGY (ELECTIVE-II)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT – I

**CRYPTOGRAPHY IN BLOCKCHAIN:** Blockchain Definitions – Blockchain versus Databases – History – Motivation – Characteristics – Types – Overview - Hashing in Blockchain – Linking blocks in blockchain – Linking blocks using SHA256 – Block structure – Blockchain functionality – Creating Blockchain – Byzantine failure problem in blockchain – Digital signatures in blockchain – Blockchain wallets

### UNIT – II

**BLOCKCHAIN DESIGN PRINCIPLES:** Networked Integrity – Distributed Power- Value as Incentive – Security – Privacy – Rights Preserved – Inclusion – Centralized Registries versus Distributed Ledgers – Public versus Private Ledgers – Transparency as a Strategic Risk – Transparency as a Strategic Asset - Zero Knowledge Proofs

### UNIT – III

**CONSENSUS ALGORITHMS:** Proof of Work – Pure Stake Based Consensus – Proof of Stake - Leased Proof of Stake – Delegated Proof of Stake – Hybrid Form of PoS and PoW – Practical Byzantine Fault Tolerance – Ripple –Tendermint – Proof of Elapsed Time – Proof of Activity – Proof of Burn – Hyperledger Fabric.

### UNIT – IV

**BLOCKCHAIN OPTIMIZATIONS AND ENHANCEMENTS:** Blockchain Optimizations – Transaction Exchange – Off-chain Transactions – Block size improvements – Blockchain enhancements – Sharding – Evolution of consensus algorithm – Proof of Stake – Proof of Activity – Byzantine Fault Tolerance Consensus Models – Proof of Elapsed Time – Cross-chain Protocol – Privacy Enhancement – Blockchain Security – Transaction Security Model – Decentralized Security Model – Attacks on Blockchain

**Text Books:**

1. Koshik Raj, “Foundations of Blockchain”, Packt Publishers, 2019.
2. S. Shukla, M. Dhawan, S. Sharma and S. Venkatesan, “Blockchain Technology: Cryptocurrency and Applications”, Oxford University Press, 2019.

**Reference Books:**

1. Josh Thompson, “Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming”, Create Space Independent Publishing Platform, 2017.
2. Andreas M. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, Oreilly Media, 1st Edition, 2014.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. “Bitcoin and cryptocurrency technologies: a comprehensive introduction”, Princeton University Press, 2016.

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**Course Code &Title: MCA-19503 FOUNDATIONS OF DATA SCIENCE (ELECTIVE II)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C503**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about Key concepts in data science, including tools, approaches, and application scenarios |
| To learn about Topics in data collection, sampling, quality assessment and repair |
| To learn about Topics in statistical analysis and machine learning |
| To learn about State-of-the-art tools to build data-science applications for different types of data, including text and CSV data |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C503.1 | Understand about Key concepts in data science, including tools, approaches, and application scenarios |
| C503.2 | Understand about Topics in data collection, sampling, quality assessment and repair |
| C50.3 | Understand about Topics in statistical analysis and machine learning |
| C503.4 | Understand about State-of-the-art tools to build data-science applications for different types of data, including text and CSV data |

## MCA-19503 FOUNDATIONS OF DATA SCIENCE (ELECTIVE-II)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT I

**INTRODUCTION TO DATA SCIENCE:** Data science process – roles, stages in data science project, setting expectations, Loading data into R – working with data from files, working with relational databases. Exploring data – Using summary statistics to spot problems, spotting problems using graphics and visualization. Managing data – cleaning and sampling for modelling and validation.

### UNIT II

**MODELING METHODS:** Choosing and evaluating models – mapping problems to machine learning tasks, evaluating models, validating models – cluster analysis – Kmeans algorithm, Naïve Bayes, Memorization Methods – KDD and KDD Cup 2009, building single variable models, building models using multi variable, Linear and logistic regression, unsupervised methods – cluster analysis, association rules.

### UNIT III

**INTRODUCTION TO R Language:** Reading and getting data into R, viewing named objects, Types of Data items, the structure of data items, examining data structure, working with history commands, saving your work in R.

**PROBABILITY DISTRIBUTIONS in R** - Binomial, Poisson, Normal distributions. Manipulating objects - data distribution.

### UNIT IV

**DELIVERING RESULTS:** Documentation and deployment–producing effective presentations –Introduction to graphical analysis – plot() function – displaying multivariate data– matrix plots – multiple plots in one window - exporting graph – using graphics parameters in R Language.

**Text Books**


1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications,2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, “Mining of Massive Datasets”, Cambridge University Press,2014.
3. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley &Sons, Inc.,2012.


**Reference Books**


1. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”,2013.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “PracticalData Science Cookbook”, Packt Publishing Ltd.,2014.
3. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley,2011.
4. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071,2015.

**Course Code &Title: MCA-19503 HUMAN COMPUTER INTERACTION (ELECTIVE II)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C503**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To learn about interaction design is and how it relates to human computer interaction and other fields. (MS -SOC B human computer interaction) |
| To learn about cognition is and why it is important for interaction design. |
| To learn about the social mechanisms that are used by people to communicate and collaborate. |
| To learn about Outlining the nature of user frustration and how to reduce it. |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C503.1 | Able to understand about interaction design is and how it relates to human computer interaction and other fields. (MS -SOC B human computer interaction) |
| C503.2 | Able to understand about cognition is and why it is important for interaction design. |
| C50.3 | Able to understand about the social mechanisms that are used by people to communicate and collaborate. |
| C503.4 | Able to understand about Outlining the nature of user frustration and how to reduce it. |

**MCA-19503 HUMAN COMPUTER INTERACTION (ELECTIVE-II)**

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

**UNIT-I**

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories.

**UNIT-II**

Command and Natural Languages:Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

**UNIT-III**

Quality of Service:Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

**UNIT-IV**

Information Search:Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text Books

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, Soren Lauesen , PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

**Course Code &Title: PYTHON PROGRAMMING (ELECTIVE III)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C504**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To introduce to the basics of Python Programming language |
| To discuss various functions and methods of Python Programming |
| To learn about Multithread Programming and GUI Programming |
| To study Web Programming and Database Programming |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C504.1 | Able to understand the basics of Python Programming language |
| C504.2 | Able to use various functions and methods of Python Programming |
| C504.3 | Able to comprehend Multithread Programming and GUI Programming |
| C504.4 | Able to understand Web Programming and Database Programming |

## MCA-19504 PYTHON PROGRAMMING (ELECTIVE III)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules, Sequences - Strings, Lists, and Tuples, Mapping and Set Types

### UNIT - II

**FILES**: File Objects, File Built-in Function [ open() ], File Built-in Methods, File Built-in Attributes, Standard Fil0es, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

**Exceptions**: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions

**Modules**: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

### UNIT - III

**Multithreaded Programming**: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

**GUI Programming**: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

### UNIT – IV

**WEB Programming**: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers

**Database Programming**: Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules.

**TEXTBOOKS:**

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Mark Lutz ,"Learning Python", O Reily, 4thEdition, 2009

**REFERENCES:**

1. Tim Hall and J-P Stacey ,"Python 3 for Absolute Beginners" , 2009
2. Magnus Lie Hetland , "Beginning Python: From Novice to Professional", 2nd Edition, 2009

**Course Code &Title: MCA-19504 PERL PROGRAMMING (ELECTIVE III)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C504**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To study the syntax and semantics of the Perl language and their similarity and differences from other programming languages |
| To discuss various forms of data representation and structures supported by the Perl language |
| To learn about Files and File handles, Runtime Evaluation & Error Trapping |
| To study CGI Programming and Administration |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C504.1 | Able to understand the basic syntax and semantics of the Perl language |
| C504.2 | Able to understand various forms of data representation and structures supported by the Perl language |
| C504.3 | Able to understand Files and Filehandles, Runtime Evaluation & Error Trapping |
| C504.4 | Able to understand CGI Programming and Administration |

## MCA-19504 PERL PROGRAMMING (ELECTIVE III)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT I

**Introduction:** What is Perl? ,Scripts vs. Programs, Comparison with Other Programming Languages: C/C++,PHP, Java/JSP, ASP, Hello World program and execution, Literals, **Manipulation of Data Structures:** Scalar Variables, Lists and Arrays, Hashes, Contexts.

### UNIT II

**Conditionals, Loops & Subroutines:** Subroutines, Packages, Conditionals, Loops, **References:** Creating a Reference, Using References, Pass By Reference, Type globs, **Object-Oriented Programming:** Object-Oriented Concepts, OOP Primer: Statistics, Inheritance.

### UNIT III

**Files and Filehandles:** Filehandles, File Input and Output Functions Directory Traversal Functions, File Test Operators, File Locking, **Regular Expressions:** Building a Pattern, Regular Expression Operators. **Runtime Evaluation & Error Trapping:** Warnings and Exceptions, Error-Related Functions, eval, Backticks and system (), Why Runtime Evaluation Should Be Restricted, Next Generation Exception Handling, Other Methods to Catch Programming Errors.

### UNIT IV

**CGI Programming:** Static Content and Dynamic Content, CGI, CGI Program ,GET vs. POST, File Upload, Important HTTP Header Fields and Environment Variables, Server Side Includes, Security Issues, **Administration:** CPAN, Accessing the Module Database on the Web, Package Managers, Installing Modules using CPAN, Installing Modules -The Traditional Way.

**TEXT BOOKS:**


1. Perl 5 Tutorial First Edition, Chan Bernard Ki Hong, Prepared from LATEX source files, Web site: http://www.cbkihong.com
2. Learning Perl Making Easy Things Easy and Hard Things Possible, O'REILLY, 7th Edition, Randal L.Schwartz, Brain D'foy and Tom Phoenix,


**REFERENCES:**


1. Perl: The Complete Reference, Second Edition, Martin C. Brown
2. Beginning Perl, Curtis Poe, John Wiley & Sons 27-Sep-2012

**Course Code &Title: MCA-19504 PHP PROGRAMMING (ELECTIVE III)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C504**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To introduce the fundamentals of PHP |
| To familiarize students with the process of PHP on the web |
| To learn to create databases in PHP |
| To study the functioning of FTP in PHP |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C504.1 | Able to understand the fundamentals of PHP |
| C504.2 | Able to understand the PHP programming works on Web |
| C504.3 | Able to create databases in PHP |
| C504.4 | Able to read databases and the functioning of FTP in PHP |

## MCA-19504 PHP PROGRAMMING (ELECTIVE III)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT I

PHP FUNDAMENTALS: PHP – Exploring the PHP Environment – HTML Embedding, Comments – Variables, Data types – Operators – PHP String functions, Controls Structures, Arrays – Types – Multi dimension array – Array functions, Functions in PHP.

### UNIT II

WEB PAGES WITH PHP: Embedding into HTML, User Input, Safe Handling user Input, PHP Form, form processing, Working with Form Data, GET, POST, REQUEST, Reading Data in web Pages, Performing Data validation, required data, number, text, Cookies and Session in PHP

### UNIT III

WORKING WITH DATABASE: MySQL, Creating Database and Table, CURD, JOIN, Aggregate Queries, Connecting to MySQL with PHP, Accessing and Updating Database with PHP, SQL injections, Prepared Statements.

### UNIT IV

ADVANCED CONCEPTS: File Handling -Create, Open, read, write to files, Working with FTP in PHP, PHP mail functions, Advanced mail functions, Building and Formatting dates and times, PHP filters.

**TEXT BOOKS:**

1. Steven Holzner, "PHP: The Complete Reference", Tata McGraw Hill Education, 1st Edition,2007.

**REFERENCES:**

1. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", Pearson, 4th Edition.
2. Larry Ullman, "PHP and MySQL for Dynamic Web Sites", Prentice Hall, 4th Edition.
3. George Schlossnagle,"Advanced PHP Programming", First Edition, Sams Publishing.

**Course Code &Title: MCA-19505 MACHINE LEARNING (ELECTIVE IV)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C505**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To introduce students to the basic concepts and techniques of Machine Learning |
| To discuss Decision Tree learning, Artificial Neural Networks |
| To learn about Bayesian learning, Instance-Based Learning |
| To study various Genetic Algorithms, Learning Sets of Rules |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C505.1 | Able to understand the basic concepts and techniques of Machine Learning |
| C505.2 | Able to understand Decision Tree learning, Artificial Neural Networks |
| C505.3 | Able to understand Bayesian learning, Instance-Based Learning |
| C505.4 | Able to understand Genetic Algorithms, Learning Sets of Rules |

## MCA-19505 MACHINE LEARNING (ELECTIVE IV)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT - I

**Introduction -** Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept earning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

### UNIT - II

**Decision Tree learning –** Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

**Artificial Neural Networks –** Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks

### UNIT - III

**Bayesian learning –** Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example learning to classify text, Bayesian belief networks The EM algorithm

**Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

### UNIT - IV

**Genetic Algorithms** – Motivation, Genetic Algorithms, an illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

**Learning Sets of Rules** – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

**Text Books:**


1. Machine Learning–Tom Mitchell, McGraw Hill Education; First edition(1July2017) **ISBN-10:**1259096955
2. Machine Learning: An Algorithmic Perspective, Second Edition, Stephen Marsl and, Taylor & Francis (CRC) 2014. ISBN-13: 978-1-4665-8333-7 (eBook -PDF)


**Reference Books:**


1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge University Press. 2009. ISBN-13978-0-511-59557-8
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley &Sons Inc., 2001. ISBN:978-0-471-05669-0
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.ISBN-10:0-387-31073-8
4. Machine Learning by Peter Flach, Cambridge. 2012. ISBN978-1-107-09639-4

**Course Code &Title: MCA-19505 EMBEDDED SYSTEMS(ELECTIVE IV)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C505**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To study the basics of embedded systems its examples, the 8051 Microcontroller architecture and its instruction set. |
| To discuss various software architectures in embedded systems. |
| To learn about Advanced Controller and Processors,Advanced Microcontrollers ATOM processor - Architecture-Instruction set. |
| To study various embedded software development tools. |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C505.1 | Able to understand the basic architecture of 8051 micro controller |
| C505.2 | Able to understand various software architectures in embedded systems. |
| C505.3 | Able to understand Advanced Controller and Processors, Advanced Microcontrollers ATOM processor - Architecture-Instruction set. |
| C505.4 | Able to understand embedded software development tools. |

## MCA-19505 EMBEDDED SYSTEMS(ELECTIVE IV)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT-I

Introduction to Embedded System: Introduction to Embedded system - Microprocessor V/s Micro-controller - 8051 Microcontroller - General architecture - Instruction set and Assembly programs - Embedded C programs.

### UNIT-II

Memory and Interface: Memory organization and interfacing - I/O devices and interfacing Counters and Timers - Serial data communication - Interrupts.
Interfacing Peripherals: Interfacing LCD Display – Keypad Interfacing – Generation of Gate signals for Converters and Inverters – Motor Control – Controlling AC appliances – Measurement of frequency – Standalone Data Acquisition System.

### UNIT-III

Advanced Controller and Processors: Advanced Microcontrollers - PIC - ARM - ATOM processor - Architecture-Instruction set.

### UNIT-IV

Designing and Development of Applications: Design methodologies and tools - designing hardware and software components - system analysis and architecture design - system integration – debugging - case studies

**Text Books**

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi., "The 8051 Microcontroller and Embedded systems", Second Edition, Pearson Education, 2008.
2. Lyla B.Das “Embedded systems an integrated approach”, Pearson Education, 2013.
3. Wayne wolf “Computers as components”, second edition, Elsevier, 2011.

**References**

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, “PIC Microcontroller an Embedded Systems using Assembly and C for PIC18”, Pearson Education, 2008.
2. Andrew N Sloss, D. Symes, C. Wright, ” Arm system developers guide”, Morgann Kauffman / Elsevier, 2006.
3. Peter Bary Patrick Crowley “Modern Embedded computing”, Elsevier, 2012.

**Course Code &Title: MCA-19505 ROBOTICS (ELECTIVE IV)**
**Semester & Year of study: V & 2021-2022**
**Course Index: C505**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| To study the basics of control systems and components |
| To discuss robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design Forward and Inverse Kinematics. |
| To learn about machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications |
| To study robot programming, Motion Commands, program Control and Subroutines. Programming methods and Branching |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C505.1 | Able to understand the basic of control systems and components |
| C505.2 | Able to understand robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design Forward and Inverse Kinematics |
| C505.3 | Able to understand machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications |
| C505.4 | Able to understand robot programming, Motion Commands, program Control and Subroutines. Programming methods and Branching. |

## MCA-19505 ROBOTICS(ELECTIVE IV)

| | | |
|---|---|---|
| **Instruction: 4 Periods/week** | **Time: 3 Hours** | **Credits: 4** |
| **Internal: 25 Marks** | **External: 75 Marks** | **Total: 100 Marks** |

### UNIT-I

CONTROL SYSTEMS AND COMPONENTS: Basic Control Systems Concepts and Models, Controllers, Control System Analysis,Classification, Components, Characteristics, Applications Robot Activation and Feedback Components, Power Transmission Systems, Robot Joint Control Design.

### UNIT-II

ROBOT END EFFECTORS**:** Types, Mechanical Grippers and Other types, Tools as End Effectors, The Robot/End Effector Interface, Considerations in Gripper Selection and Design.Position Analysis, Robots as Mechanisms, Matrix Representation, Transformation Matrices, Forward and Inverse Kinematics.

### UNIT-III

MACHINE VISION:Introduction,Sensor Characteristics, Description of Different Sensors. The Sensing and Digitizing function, Image processing and Analysis,Training and Vision Systems, Robotic Applications Characteristics of Actuating Systems, Actuating Devices and Control.

### UNIT-IV

ROBOT PROGRAMMING: The Textual Robot languages, Generations of Robot programming languages, Robot language Structures, Constants, Variables, and other data Objects, Motion Commands, program Control and Subroutines. Programming methods, Robot program as a path in space, Motion Interpolation, WAIT, SGNAL, DELAY Commands, Branching.

**TEXT BOOK:**

**1.** Mikell P. Groover , Mitchell Weiss , Roger N. Nagel , Nicholas G. Odrey Industrial Robotics: Technology, Programming, and Applications , 1st edition, McGraw-Hill International Edition, 1986

**2.** Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.

**REFERENCE BOOK:**

**1.** K.S.Fu, R.C Gonzalez, C.S.G.Lee , ROBOTICS , Control, Sensing , Vision and Intelligence , 1st edition, McGraw-Hill International Edition, 1987.

**2.** R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003.

**3.** Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehel, Oxford University Press 1998.

**Course Code &Title: MCA-19506 BIG DATA ANALYTICS LAB**
**Semester & Year of study: V & 2021-2022**
**Course Index: C506**

**Course Objectives:**
The learning objectives of this course are:

| Course Objectives |
|---|
| Learn how to implement data structures, generic types |
| Learn how to setup and install Hadoop |
| Learn how to implement file management tasks and programs in Hadoop |

**Course Outcomes:**
By the end of the course, the student will be

| Course Index | Course Outcomes |
|---|---|
| C505.1 | Able to implement data structures, generic types |
| C505.2 | Able to setup and install Hadoop |
| C505.3 | Able to implement file management tasks and programs in Hadoop |

## MCA-19506 BIG DATA ANALYTICS LAB

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**
**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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**List of Experiments:**

1. Write a Java Program to implement Linked Lists, Stacks and Queues.
2. Write Java Program that implements Generic Types which collects pair of elements of different types.
3. Write a Java Program that uses object serialization and deserialization.
4. Know about setting up and Installing Hadoop in its three operating modes and implement in Standalone.
5. Implement the following file management tasks in Hadoop: Adding, Retrieving and deleting files.

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

6. Write a Map-Reduce Program to find average of numbers.
7. Implement Matrix Multiplication with Hadoop Map Reduce
8. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

**REFERENCES:**

1. Big Java Fourth Edition Cay Horstmann Wiley, John Wiley & Sons
2. www.hadoop.apache.org
3. www.gist.github.com

**MCA-19507 MINI PROJECT**

**Practical: 3Periods/week** **Time:3Hours** **Credits: 2**

**Internal:50Marks** **External:50Marks** **Total: 100Marks**

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- **Do Mini Project by using ELECTIVE - III**

## SEMESTER VI (THIRD YEAR) CURRICULUM

| code | Course Title | Max Marks | | Total Marks | Hours Per Week | | Credits |
|---|---|---|---|---|---|---|---|
| | | External | Internal | | Theory | Practical | |
| MCA -19601 | Project | | | | | - | 16 |