Syllabus

for

Master of Computer Application (M.C.A.)

Under
Choice Based Credit System (CBCS)

Effective from
Academic Session 2020-21

Department of Computer Science and Information Technology
Khwaja Moinuddin Chishti Language University
Sitapur-Hardoi Bypass, IIM Road, Lucknow - 226013

Department of Computer Science and Information Technology

MCA: YEAR –I, SEMESTER-I

Subject Code	Subject Name	L	T	P	C	IA	ESE	Total
MCA101	Fundamental of Computers & Emerging Technologies	3			3	30	70	100
MCA102	Problem Solving using C	3	1		4	30	70	100
MCA103	Digital Logic and Computer Organization	3	1		4	30	70	100
MCA104	Discrete Mathematics	3			3	30	70	100
MCA105	Computer based Numerical and Statistical Techniques	3			3	30	70	100
MCA106	Lab: Problem Solving using C			2	2	30	70	100
MCA107	Lab: CBNST			1	1	30	70	100
GE1	Generic Elective I	3	1		4	30	70	100
	Total				**24**			**800**

MCA: YEAR –I, SEMESTER-II

Subject Code	Subject Name	L	T	P	C	IA	ESE	Total
MCA201	Object Oriented Programming using Java	3	1		4	30	70	100
MCA202	Data Structures	3	1		4	30	70	100
MCA203	Operating System	3			3	30	70	100
MCA204	Database Management System	3			3	30	70	100
MCA205	Lab: OOP using JAVA			2	2	30	70	100
MCA206	Lab: DS using C/C++			2	2	30	70	100
MCA207	Lab: DBMS			2	2	30	70	100
GE2	Generic Elective II	3	1		4	30	70	100
	Total				**24**			**800**

Note: Students of Department Computer Science and Information Technology will opt any Generic Elective course offered by other departments / Subjects.

MCA: YEAR II, SEMESTER-III

Subject Code	Subject Name	L	T	P	C	IA	ESE	Total
MCA301	Software Engineering	3	1		4	30	70	100

MCA302	Data Communication and Computer Network	3	1		4	30	70	100
MCA303	Python Programming	3	1		4	30	70	100
MCA304	Elective-1	3	1		4	30	70	100
MCA305	Elective-2	3	1		4	30	70	100
MCA306	Lab: Python Programming			2	2	30	70	100
MCA307	Lab- Mini Project			4	2	60	140	200
	Total				**24**			**800**

MCA: YEAR II, SEMESTER-IV

Subject Code	Subject Name	L	T	P	C	IA	ESE	Total
MCA401	Artificial Intelligence	3	1		4	30	70	100
MCA402	Elective-3	3	1		4	30	70	100
MCA403	Elective-4	3	1		4	30	70	100
MCA404	Major Project			12	12	50	250	300
	Total				**24**			**600**

MAJOR PROJECT CREDIT DISTRIBUTION

Subject Code	Subject Name (Evaluation Types)	L	T	P	C	IA	ESE	Total
MCA404A	**A**-Development/Field work/ Dissertation Writing				**4**	**50**	**100**	**150**
MCA404B	**B-**Dissertation Presentation/ Seminar / Final Viva				**6**		**150**	**150**

Total Credits: 96 **Grand Total (Maximum Marks) = 3000**

LIST OF ELECTIVE PAPERS

Elective-1
MCAE11- Cryptography & Network Security
MCAE12- Data Warehousing & Data Mining
MCAE13- Cloud Computing
MCAE14- Compiler Design

Elective-2
MCAE21- Web Technology
MCAE22- Simulation & Modeling
MCAE23- Software Testing & Quality Assurance
MCAE24- Digital Image Processing

Elective-3
MCAE31- Privacy & Security in Online Social Media
MCAE32- Pattern Recognition
MCAE33- Data Analytics
MCAE34- Software Quality Engineering

Elective-4
MCAE41- Neural Network
MCAE42- Internet of Things
MCAE43- Machine Learning
MCAE44- Distributed Database Systems

- L: Lecture, T: Tutorial, P: Practical, C: Credit, CT: Class Test, IA: Internal Assessment, ESE: End Semester Examination.
- Students are required to select one course from each set of electives (Elective-1 to Elective-4) offered by the department
- ESE=70, IA=30, P=70 (40 Marks for Practical Problems, 20 Marks for Viva-Voce, 10 Marks for Lab Record)
- The weight age of Internal Assessment and External Assessment will be in the ratio of 30% and 70% of total marks in all theory, practical papers & projects.

MCA Semester I
MCA101 - Fundamental of Computers & Emerging Technologies

Credit: 03, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours

OBJECTIVES OF THE COURSE: To demonstrate the knowledge of the basic structure, components, features and generations of computers. To describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts. To Compare and contrast features, functioning & types of operating system and computer networks. To demonstrate architecture, functioning & services of the Internet and basics of multimedia. To illustrate the emerging trends and technologies in the field of Information Technology.

UNIT-I **Lectures: 13**

Introduction to Computer: Definition, Computer Hardware & Computer Software
Components: Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary. Software - Introduction, Types– System and Application.
Computer Languages: Introduction, Concept of Compiler, Interpreter & Assembler
Problem solving concept: Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.
Operating system: Definition, Functions, Types, Classification, Elements of command based and GUI based operating system.

UNIT-II **Lectures: 11**

Computer Network: Overview, Types (LAN, WAN and MAN), Data communication, topologies.
Internet : Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers.
Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.

UNIT-III **Lectures: 10**

Block chain: Introduction, overview, features, limitations and application areas fundamentals of Block Chain.
Crypto currencies: Introduction, Applications and use cases
Cloud Computing: It nature and benefits, AWS, Google, Microsoft & IBM Services.

UNIT-IV **Lectures: 11**

Emerging Technologies: Introduction, overview, features, limitations and application areas of Augmented Reality , Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface

References:

1. Rajaraman V., “Fundamentals of Computers”, Prentice-Hall of India.
2. Norton P., “Introduction to Computers”, McGraw Hill Education.

3. Goel A., “Computer Fundamentals”, Pearson.
4. Balagurusamy E., “ Fundamentals of Computers”, McGraw Hill
5. Thareja R., “Fundamentals of Computers”, Oxford University Press.
6. Bindra J., “The Tech Whisperer- on Digital Transformation and the Technologies that Enable it ”, Penguin.

MCA Semester I
MCA102: Problem Solving using C

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To describe & understand the problem solving techniques. To understand the concept of basic terminology used in C programming. To develop programs in C language by writing, compiling and debugging. To develop programs involving simple statements, conditional statements, iterative statements, array, strings, functions, recursion, structure and union. To differentiate between call by value and call by reference, acquire skills of using dynamic memory allocations, use of pointers and basic operations on a file.

UNIT-I **Lectures: 09**

Basics of programming: Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming.

Basics of C: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/Output, Operators and expressions.

UNIT-II **Lectures: 12**

Conditional Program Execution: if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else.

Loops and Iteration: for, while and do-while loops, Multiple loop variables, Nested loops, break and continue statement.

Functions: Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunction program, Calling function by value, Recursive functions.

UNIT-III **Lectures: 12**

Arrays: Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays,
Multidimensional arrays.

Pointers: Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers.

Strings: Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.

UNIT-IV **Lectures: 12**

Structure: Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers

to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types. **Storage classes**: Introduction, Types- automatic, register, static and external.
Dynamic Memory Allocation: Introduction, Library functions – malloc, calloc, realloc and free.
File Handling: Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.

References:

1. Kanetkar Y., "Let Us C", BPB Publications.
2. E. Balagurusamy, Computer Concepts and Programming in C, *McGraw Hill*.
3. Yashwant Kanetkar, "Working with C", BPB Publications.
4. E. Balagurusamy, "Programming in ANSI C", TMH.
5. Reema Thareja, Computer Fundamentals and Programming in C, Oxford Publication.
6. Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, Pearson Education.
7. Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Computer Science- A Structured Programming Approach Using C, Cengage Learning.
8. Schildt H., "C- The Complete Reference", McGraw-Hill.
9. Goyal K. K. and Pandey H.M., Trouble Free C", University Science Press
10. Gottfried B., "Schaum's Outlines- Programming in C", McGraw-Hill Publications.
11. Kochan S.G., "Programming in C", Addison-Wesley.
12. Dey P. and Ghosh M., "Computer Fundamentals and Programming in C", Oxford University Press.
13. Goyal K. K., Sharma M. K. and Thapliyal M. P. "Concept of Computer and C Programming", University Science Press.

MCA Semester I
MCA103: Digital Logic and Computer Organization

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To introduce basics of digital logic circuits design and Computer Organization. To identify various number systems and work with Boolean Algebra. To understand various logic gate. To simplify the Boolean expression using K-Map and Tabulation techniques. To analyze various types of flip flops used for designing registers and counters. To understand the basic structure and operation of digital computer. To study the hierarchical memory system including cache memories and virtual memory. To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT-I **Lectures: 12**

Introduction to Digital Computer, Data Representation, Integer Representation, Boolean Algebra, Simplification of Boolean Expressions, Logic Gates, TTL circuits, Combinational Circuit, Design Procedures, Some commonly used combinational circuits, Binary Adder, Binary Subtractor 2's complement Adder Subtractor, designing with Multiplexers.

UNIT-II **Lectures: 10**

Sequential Circuits, Flip-Flop, RS-FF, JK FF, Master Slave JK FF, D-FF, T-FF, Buffer Register, Shift Register, Ripple counter, Synchronous counter, Controlled Counter, Ring counter.

UNIT-III **Lectures: 11**

Memory Device Characteristics, 2D & 3D Memories, Memory Hierarchy, Semiconductor Memories: RAM, ROM, DRAM, Flash Memory; High Speed Memories: Cache Memory, Associative Memory, Memory Interleaving.

UNIT-IV **Lectures: 12**

Input/Output Interface, I/O Bus and Interface modules, Data transfer modes (Programmed mode, Interrupt initiated I/O, DMA), Interrupt structure, Input-Output Processor (IOP), CPU-IOP Communication, Introduction to advanced computer Architectures, RISC vs CISC Architectures, Types of Parallel processors, Flynn's classification of computer systems, Pipeling, Arithmetic and instruction pipelining, Multiprocessor organizations (Loosely coupled vs Tightly coupled). Laboratory : Writing Simple Programs for Logic Circuits.

References:

1. MANO, M., "Digital Logic and Computer Design"
2. Malvino A.P., "Digital Computer Electronics"
3. Bhujade M.R., "Digital Computer Design Principles"
4. Raja Raman V. and Radha Krishnan T., "An introduction to digital computer design"
5. MANO, M., "Computer System Architecture"
6. Stallings, W., "Computer Organization & Architecture"
7. B. Ram, "Computer System Organization & Architecture

MCA Semester I
MCA104: Discrete Mathematics

Credit: 03, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours

OBJECTIVES OF THE COURSE: To learn discrete mathematical structures, mathematical logic.

UNIT-I **Lectures: 12**

Set Theory: Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set identities. Relations & Functions: Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions. Notion of Proof: Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases.

UNIT-II **Lectures: 12**

Lattices: Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

UNIT-III **Lectures: 11**

Propositional & Predicate Logic: Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic.

UNIT-IV **Lectures: 10**

Recurrence Relations: Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

References:

1. Kenneth H. Rosen , Discrete Mathematics and Its Applications, , McGraw-Hill.
2. B. Kolman, R. C. Busby, and S. C. Ross , Discrete Mathematical Structures, Prentice Hall.
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley.
4. Y N Singh, Discrete Mathematical Structures, Wiley-India.
5. Swapankumar Sarkar, "A Textbook of Discrete Mathematics", S. Chand & Company PVT. LTD.V.
6. Krishnamurthy, "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.
7. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
8. J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to Computer Science", McGraw Hill.

MCA Semester I
MCA105: Computer based Numerical and Statistical Techniques

Credit: 03, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours

OBJECTIVES OF THE COURSE: To develop a thorough understanding of the methods of numerical differentiation and integration. To gain knowledge in measures of central tendency and dispersion. To learn how to formulate and test the hypotheses about means, proportions and standard deviation to draw conclusions based on the results of statistical tests in large sample. To get exposed to finite differences and interpolation. To develop, debug and document programs for solving numerical and statistical problems.

UNIT-I **Lectures: 12**

Floating Point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation. Computer Arithmetic: Significant Figures, Rounding off, Truncation, Absolute, Relative and Percentage Errors, Function of Single and Several Variables, Propagation of Errors in Arithmetic Operations.

Numerical Differentiation and Integration: Introduction to Numerical Differentiation, Numerical Integration: Trapezoidal rule, Simpson's rules, Numerical Solution of Ordinary Differential Equations: Taylor's Series and Euler's Methods, Modified Euler's Method, Runge-Kutta and Predictor Corrector Methods, Automatic error monitoring, Stability of solution.

UNIT-II **Lectures: 11**

Solutions of Transcendental and Simultaneous Linear Equations: Solution of Non-linear Equations: Newton Raphson Method, Bisection Method, Regula-Falsi Method, Discussion on Convergence of Solution. Solution of Simultaneous Linear Equations: Iterative Methods, Gauss Jacobi Iterative Method, Gauss-Seidel Iteration Method, Comparison of Direct and Iterative Methods.

UNIT-III **Lectures: 11**

Interpolation and Approximation: Interpolation with Unequal Intervals: Lagrange's Method, Divided Difference Method, Divided Difference Table, Newton's Divided Difference Method, Inverse Interpolation, Polynomial and Curve Fittings, Correlation: Partial and multiple Correlation (for three variables only), Method of least squares, fitting of straight lines, polynomials, exponential curves.

UNIT-IV **Lectures: 11**

Statistical Computation: Statistical tools and techniques: Measure of central tendencies: Mean, Mode, Median, Measure of dispersion: Range, Variance and Standard Deviation, Frequency Distribution and Cumulative Frequency Distributions, Regression Analysis: Linear and Non linear regression, Multiple regression, Testing of Hypothesis: Test of Significance, Chi-square test, t-test, ANOVA, F-test.

References:

1. Rajaraman V., "Computer Oriented Numerical Methods", PHI.
2. Gerald& Wheatley, "Applied Numerical Analyses", AW.

3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
4. Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
5. T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH.
6. PradipNiyogi, "Numerical Analysis and Algorithms", TMH.
7. FrancisScheld, "Numerical Analysis", TMH.
8. Gupta S.P. and Kapoor, V.K., Fundamentals of Applied statistics, Sultan Chand & Sons.
9. Gupta S.P. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
10. A.M. Goon, M.K. Gupta and T.S. Dasgupta, Fundamentals of Statistics, The World Press Pvt. Ltd.
11. A.M. Goon, M.K. Gupta and T.S. Dasgupta, An Outline of Statistical Theory, The World Press Pvt. Ltd.
12. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education.
13. S.R. Otto Denier, An Introduction to Programming and Numerical Methods in MATLAB, and J.P. Springer.

MCA106: Lab: Problem Solving using C

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To write, compile, debug and execute programs in a C programming environment. To learn programs that incorporate use of variables, operators and expressions along with data types. To learn programs for solving problems involving use of decision control structures and loops. To learn programs that involve the use of arrays, structures and user defined functions. To Write programs using file handling operations.

- Program to implement conditional statements in C language.
- Program to implement switch-case statement in C language
- Program to implement looping constructs in C language.
- Program to perform basic input-output operations in C language.
- Program to implement user defined functions in C language.
- Program to implement recursive functions in C language.
- Program to implement one-dimensional arrays in C language.
- Program to implement two-dimensional arrays in C language.
- Program to perform various operations on two-dimensional arrays in C language.
- Program to implement multi-dimensional arrays in C language.
- Program to implement string manipulation functions in C language.
- Program to implement structure in C language.
- Program to implement union in C language.
- Program to perform file handling operations in C language.

MCA107: Lab: CBNST

Credit: 01, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To help students learn solving numerical and statistical problems using programming in C.

- Program to implement Floating Point Arithmetic in C language.
- Program to implement Numerical Differentiation and Integration in C language.
- Program to implement Solutions of Transcendental and Simultaneous Linear Equations in C language.
- Program to implement Interpolation and Approximation in C language.
- Program to implement various methods of Statistical Computation in C language.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

MCA Semester II
MCA201: Object Oriented Programming using Java

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand Object Oriented Concepts using Java Language. To develop, debug and document programs in Java using OOP paradigms.

UNIT-I **Lectures: 12**

To learn about history of Java, To learn, where is Java being used, To learn, what is the Java Virtual Machine? What is its role?, To learn about various standard packages available in java and their uses. Java naming conventions. Introduction to java, comparison between C, C++ and Java, Why java is so important, Compiling and running java program. Basic structure of java program, Java programming: data types, variable, constants, operators, control statements (if, switch, loops),break, continue statements, ternary operator, bit wise operators, user defined data types in Java. Order of evaluation of different operators in java. How to read input from keyboard?

UNIT-II **Lectures: 11**

Objects, classes and methods, Constructing objects, Accessor and mutator methods, object references, Java classes: Abstract classes, static classes, Inner classes, Wrapper classes; Designing classes: Choosing classes, accessors, mutators and immutable classes, side effects, static methods, static field, scope, introduction to strings, string tokenization, methods, method overloading, constructor overloading, use of this keyword, use of toString( ) method, arrays. Arrays of objects, recursive method.

UNIT-III **Lectures: 11**

Defining an interface, implementing interfaces, using interfaces for code reusing, converting between class and interface types, using interfaces for callbacks; Polymorphism, Inheritance: Inheritance hierarchies, Inheriting instance fields and methods, Sub class construction, converting between sub class and super class types, cosmic super class, Access control: private access, public access, protected access and package access.

UNIT- IV **Lectures: 11**

Exception handling: Importance of exceptions, throwing exceptions, checked and unchecked exceptions, catching exceptions, finally clause. Files and Streams: streams, readers, and writes, reading and writing text files. Applets and Graphics: Why applets, Introduction to HTML, A simple applet, graphical shapes, colors, fonts, drawing complex shapes, reading text input inside applet. AWT: introduction, labels, buttons, check boxes, events etc; Layout manager: flow layout, border layout, grid layout, card layout; Menus: Dialog boxes, File dialog; Applet classes, Applet life cycle. Introduction of Java Swing.

References:

1. A.R.Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH.
2. R.Lafore, “Object Oriented Programming using C++”, Galgotia Publications.
3. E. Balagurusamy, “Object Oriented Programming with C++”, TMH.
4. Liang, “Introduction to Java Programming, Comprehensive Version”, Pearson Education.

5. E Balagurusamy, “Programming in JAVA”, Tata Mcgraw-hill Education Pvt. Ltd.
6. Cay Horstmann Java Concepts, John Wiley & Sons, Inc.
7. Cay Horstmann, Big Java John Wiley & Sons, Inc.
8. Deitel and Deitel, Java, How to Program, Prentice-Hall.
9. David Flanagan, Java in a Nutshell, O'Reilly.
10. Herbert Schildt, "Java The complete reference", McGraw Hill Education.
11. Steven Holzner, “Java Black Book”, Dreamtech.
12. Balagurusamy E, “ Programming in Java”, McGraw Hill
13. Naughton, Schildt, “The Complete reference java2”, McGraw Hill

MCA Semester II
MCA202: Data Structure

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To develop the understanding of data structures. To learn the applications of various data structures. To be familiar with utilization of data structure techniques in problem solving. To implement them using C programming language.

UNIT-I **Lectures: 11**

Introduction, Data Types, Time and Space complexities, Arrays and Strings: Introduction, Data Types- Primitive, Abstract and Polymorphic, Notion of complexity, Derivation of time and space complexities. Array- Linear and Multidimensional Array, Representations and operations, Matrices- Sparse Matrix, String-Representation and operations, Applications-Binary Search, Bubble, Selection and Insertion Sorts.

UNIT-II **Lectures: 12**

Linked Lists, Stacks and Queues: Linked List, Linear Linked List, Doubly Linked Lists, Circular and Header Linked List, Representations, Operations and Applications-Polynomial manipulation. Stacks, Different representations and Operations, Multiple Stacks, Applications Parenthesis Checker, Mathematical Notation Translation (Prefix, Infix, Postfix), Quick Sort, Queue, Different representations and Operations, Linear and Circular Queues, Deques, Applications-Priority Queue.

UNIT-III **Lectures: 11**

Tree and Graphs: Basics of Trees, Representations, Operations and Applications of Binary Tree, Binary Search Tree, AVL Tree, M-Way Search Tree, B Trees, B+ Trees, Threaded Binary Trees, Heap. Graph Terminology, Different Representations, Operations and Applications, Breadth First Search (BFS), Depth First Search (DFS), Spanning Trees, Minimum Spanning Trees, Single Source and All Pair Shortest Path Algorithms.

UNIT-IV **Lectures: 11**

Searching, Sorting, Merging and Hashing: Linear and Binary Search Methods, Merging, Sorting-Bubble, Selection, Insertion, Radix, Merge, Quick, Heap Sorts, Hashing- Introduction, Hash Table, Hash Functions, Collisions and Resolution.

References:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia.
2. Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.
3. S. Lipschutz, Data Structures Mc-Graw Hill International.
4. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to Data Structures with Applications, Tata Mc-Graw Hill International Edition.
5. A. Michael Berman, Data structures via C++, Oxford University Press.
6. M. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education.
7. Tremblay & Sorenson, An Introduction to Data Structures with Applications, Mcgraw Hill.

8. R.S. Salaria, Data Structures and Applications using C, Khanna Book Publishing.
9. Samanta D., "Classic Data Structures", Prentice Hall India.

MCA Semester II

MCA203: Operating System

Credit: 03, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours

OBJECTIVES OF THE COURSE: To develop the understanding of the structure and functioning of Operating System. To learn about Processes, Threads and Scheduling algorithms. To understand the principles of concurrency and Deadlock. To learn various memory management schemes. To study I/O management and File systems.

UNIT-I **Lectures: 12**

INTRODUCTION Evolution of Operating System, Operating System Structure, types of Operating System: Batch Processing, Multiprogramming, Timesharing, Distributed System, Real Time System. Process: Concepts, Process control blocks, concurrency, mutual exclusion, semaphores, Interprocess Communication, Process Synchronization.

UNIT-II **Lectures: 11**

Processor management techniques; Threads, Process Scheduling, Scheduling Criteria types of scheduling, scheduling algorithms, Deadlocks, Deadlocks Prevention, Deadlocks Avoidance, Deadlocks Detection.

UNIT-III **Lectures: 11**

Memory Management: Real storage, Contiguous Vs. Non Contiguous storage allocation, Static and Dynamic Partitioned memory allocation; Virtual memory, management of virtual memory, Paging, Segmentations, Segmentation with Paging.

UNIT-IV **Lectures: 11**

I/O Management: Disk Organization, disk space management, disk scheduling, Files types and operations, File access and security, File storage Management, File Organization, Operating System security, Case Study of UNIX/LINUX OS.

References:

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Addision-Wesley
2. Milan Milankovic, "Operating Systems, Concepts and Design", Tata McGraw-Hill.
3. Harvey M Deital, "Operating Systems", Addison Wesley
4. Richard Peterson, "Linux: The Complete Reference", Osborne Tata McGraw-Hill.
5. SibsankarHalder and Alex A Aravind, "Operating Systems", Pearson Education
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick & John J. Donovan. Operating Systems. McGraw Hill.
9. A. S. Tanenbaum, "Modern Operating Systems", PHI.
10. William Stallings, "Operating Systems – internals and design principles", PHI.

MCA Semester II
MCA204: Database Management System

Credit: 03, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours

OBJECTIVES OF THE COURSE: To learn the features of a database system and its application and compare various types of data models. To construct an ER Model for a given problem and transform it into a relation database schema. To formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus. To understand the need of normalization and normalize a given relation to the desired normal form. To understand different approaches of transaction processing and concurrency control.

UNIT-I **Lectures: 11**

Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

UNIT-II **Lectures: 12**

Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

UNIT-III **Lectures: 10**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

UNIT-IV **Lectures: 12**

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System. **Concurrency Control Techniques.**

References:

1. Date, C.J.,"An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Korth, Silbertz, Sudarshan, “Database Concepts”, Tata Mcgraw-hill Education (India).
3. Elmasri, Navathe, “Fundamentals Of Database Systems”, Pearson Education New Delhi India.
4. G.K. Gupta, “Database Management System”, Tata Mcgraw-hill Education (India) Pvt. Ltd.

5. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication.
6. Majumdar & Bhattacharya, “Database Management System”, Tata Mcgraw-hill Education.
7. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill (India) Pvt Ltd.
8. Chakravarti, “Advanced Database Mnagement System” Wiley Dreamtech Publications.
9. Ullman, J.D.,"Principles of Database Systems", Galgotia Publications, New Delhi.
10. James Mortin- Principles of Database Management Object Oriented Modeling & Design.

MCA Semester II
MCA205: Lab- OOP using JAVA

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To learn and implement OOP concepts using Java programming language. To apply object oriented techniques to analyze, design and develop a complete solution for a given problem.

- Use Java compiler and eclipse platform to write and execute java program.
- Creating simple java programs,
- Understand OOP concepts and basics of Java programming.
- Create Java programs using inheritance and polymorphism.
- Implement error-handling techniques using exception handling and multithreading.
- Understand the use of java packages.
- File handling and establishment of database connection.
- Develop a calculator application in java.
- Develop a Client Server Application.
- Develop GUI applications using Swing components.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

MCA Semester II
MCA206: Lab- DSA using C/C++

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To learn implementation of various Data Structures. To applying data structures in solving real life problems using C/C++. To learn implementation of various Data Structures.

Program in C or C++ for following:

- To implement addition and multiplication of two 2D arrays.
- To transpose a 2D array.
- To implement stack using array
- To implement queue using array.
- To implement circular queue using array.
- To implement stack using linked list.
- To implement queue using linked list.
- To implement BFS using linked list.
- To implement DFS using linked list.
- To implement Linear Search.
- To implement Binary Search.
- To implement Bubble Sorting.
- To implement Selection Sorting.
- To implement Insertion Sorting.
- To implement Merge Sorting.
- To implement Heap Sorting.
- To implement Matrix Multiplication by strassen's algorithm
- Find Minimum Spanning Tree using Kruskal's Algorithm

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

MCA Semester II
MCA207: Lab-DBMS

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE:. To write SQL commands to query a database. To develop database and writing queries using MySQL, SQL Server/Oracle. To write, debug and implement SQL programs in MySQL, SQL Server/Oracle. To learn programming in SQL.

- Installing SQL Server/Oracle/ MYSQL.
- Creating Entity-Relationship Diagram using case tools.
- Writing basic SQL statements.
- Restricting and sorting data.
- Displaying data from multiple tables.
- Aggregating data using group function.
- Manipulating data.
- Creating and managing tables.
- Normalization.
- Creating procedure and functions etc.
- Design and implementation of Payroll processing system.
- Design and implementation of Library Information System.
- Design and implementation of Student Information System.
- Automatic Backup of Files and Recovery of Files.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

MCA Semester III
MCA301: Software Engineering

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the methodologies involved in the development and maintenance of software over the entire life cycle. To learn about generic models of software development process. To understand fundamental concepts of requirements engineering and Analysis Modeling. To understand the different design techniques and their implementation. To learn various testing and maintenance measures. To understand Project management and Quality Assurance plan and measures.

UNIT-I **Lectures: 12**

Introduction to Software Engineering: The Evolving role of software. Software characteristics and applications, Evolution of Software Engineering, Software crisis, Software Engineering problems, Software development life cycle. Software Engineering Paradigms, Software Process, Project and Products.

Planning a Software Project: Cost Estimation (COCOMO and Function Points Model), Project Scheduling, Staffing and Personnel Planning, Software Configuration Management Plan, Quality Assurance Plans, Project Monitoring Plans, Risk Management.

UNIT-II **Lectures: 11**

Software Design: Design objectives and principles, Design for Reuse & Change, Design Methodology: Structured Design and Object-oriented approach. Module level concepts: Coupling and Cohesion. Design Notation and specification, Metrics, Design validation & verification, Metrics.

Detailed Design: Module specification, Detailed Design, Verification and Metrics (Cyclomatic Complexity, Data Bindings, Cohesion Metric).

UNIT-III **Lectures: 11**

Software Implementation: Implementation issues, Coding. **Programming Practices:** Structured coding and object oriented coding techniques, Modern programming language features. Verification and Validation techniques (Code reading, Static Analysis, Symbolic Execution, Proving Correctness, Code Inspections or Reviews, Unit Testing). **Coding:** Programming Principles and guidelines, Coding Process **Metrics:** Size Measures, Complexity Metrics, Style Metrics. **Documentation:** Internal and External Documentation.

UNIT-IV **Lectures: 11**

Software Testing, Maintenance and Quality Assurance: Error, Fault and Failure, Test Oracles, Test Case and Test Criteria, Psychology of Testing. Testing Objectives and Principles, Test Case Design. Approaches to Software Testing, Black Box testing and White Box testing.

Testing Process: Comparison of Different Techniques, Levels of Testing, Test Plans, Test Case Specifications, Test Case Execution and Analysis.

Software Reliability, Software Maintenance, Software Quality Assurance & International Standards, Clean Room Software Engineering, CASE Tools, The Road Ahead.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
3. Pankaj Jalote, Software Engineering, Wiley
4. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
5. Jibitesh Mishra and Ashok Mohanty, Software Engineering : Pearson.
6. Deepak Jain," Software Engineering: Principles and Practices",Oxford University Press.
7. Munesh C. Trivedi, Software Engineering, Khanna Publishing House.
8. N.S. Gill, Software Engineering, Khanna Publishing House.
9. Sommerville, I., Software Engineering, Narosa.
10. Fairley, R.E., Software Engineering Concept, Mc-Graw Hill.
11. Shooman, M., Software Engineering, Mc-Graw Hill.
12. Robert N. Charett, Software Engineering Environments, McGraw Hill.

MCA Semester III
MCA302: Data Communication and Computer Network

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To introduce the concepts, terminologies and technologies used in data communication and computer networking. To study and analyze the of OSI and TCP/IP Protocol Suites. To be familiar with the data transmission processes, transmission media and tools. To get familiarized with different routing protocols, congestion control protocols and network performance issues.

UNIT-I **Lectures: 12**

DATA COMMUNICATIONS :- Data communication Components – Data representation and Data flow – Networks – Types of Connections – Topologies – Protocols and Standards – OSI model – Transmission Media – LAN –Wired LANs, Wireless LANs, Connecting LANs, Virtual LANs.

UNIT-II **Lectures: 11**

DATA LINK LAYER:- Error Detection and Error Correction – Introduction–Block coding–Hamming Distance – CRC–Flow Control and Error control – Stop and Wait – Go back – N ARQ – Selective Repeat ARQ – Sliding Window – Piggybacking – Random Access – CSMA/CD,CDMA/CA.

UNIT-III **Lectures: 11**

Switching–Logical addressing – IPV4 – IPV6–Address mapping–ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT-IV **Lectures: 11**

Process to Process Delivery – User Datagram Protocol – Transmission Control Protocol – SCTP – Congestion Control with Examples.

APPLICATION LAYER:- Domain Name Space – DDNS – TELNET – EMAIL – File transfer WWW – HTTP – SNMP – Cryptography – Basic concepts.

References:

1. Tanenbaum, A.S., Computer Networks, 4th Edition, PHI.
2. Stallings, W., Data and Computer Communication, 8th Edition, PHI.
3. Kurose, J.F., Ross, K.W., Computer Networking, Pearson Education.
4. Forouzan, B. Data Communications and Networks, TMH.
5. Forouzan, B. Local Area Networks, TMH.
6. James Martin, Satellite Communication System.
7. W.Tomasi, Introduction to Data Communications and Networking, Pearson Education.
8. Brijendra Singh, Data Communication and Computer Networks, PHI.

MCA Semester III
MCA303: Python Programming

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand to solve the problem and its techniques. To work with standard control structures. To explore the techniques of procedural abstraction with function definitions. To explore the use of strings, text files, lists and dictionaries. To understand the concept of object-oriented design with class and method. To understand to solve the problems with python database, python multithreading. To work with django framework, Numpy.

UNIT-I **Lectures: 12**

Problem solving: Planning a computer program, Problem solving techniques. Getting started with Python programming- Running code in interactive shell. Input, processing and output. Editing, saving and running script. How python works. Data Types and Expressions.
Control & Conditional Statements. Design with Functions- Function as abstraction mechanism, Problem solving with Top-Down design, Design with recursive functions.

UNIT–II **Lectures: 11**

Strings and Text Files. List and Dictionaries: Lists, defining simple function, dictionaries. Exceptions and data structures -- Data Structures (array, List, Dictionary).
Object Oriented Design: Design with Classes, Programming types , Object Oriented Programming , Structuring classes with Inheritance and Polymorphism. Case study- request, analysis, design & implementation. Python Regular Expression, Python Exception Handling.

UNIT–III **Lectures: 11**

Python Database Interaction: SQL Database connection using python Creating and searching tables Reading and storing config information on database Programming using database connections.
Python Multithreading: Understanding threads Synchronizing the threads Programming using multithreading.

UNIT–IV **Lectures: 11**

Logging in python, Introduction to Django framework:. Introduction to Django framework, Creating a project and application, Urls, models, templates and views files, Introduction to web development, Introduction to Pycharm.
Numpy: Main advantages of Numpy arrays over Python list, Creating arrays.

References:

1. Kenneth A. Lambert, Martin, Juneja "Fundamentals of Python", Cengage Learning.
2. Harsh Bhasin, “Python for Beginners”, New Age International.
3. Ashok Namdev Kamthane , Programming and Problem Solving with Python, TMH.
4. Allen Downey, Learning with Python, Dreamtech.

MCA Semester III

MCA304-Elective-1
MCA305-Elective-2

MCA306: Lab- Python Programming

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To learn Python programming language.

Programming exercise in Python:

- Problem solving, Strings and Text Files. List and Dictionaries.
- Object Oriented Design
- Python Database Interaction
- Python Multithreading
- Logging in python
- Introduction to Django framework
- Numpy

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

MCA Semester III
MCA307: Mini Project (Software/Research)

Credit: 02, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE: To help students develop openness to new ideas in computer science. To develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills. To help students develop a research project. To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc.)

Minor-Project using Web Engineering Tools: Design and Implementation of Web Applications, Web Services, Mobile Applications etc. Students are required to incorporate the followings: Dynamic Pages, Adding Dynamic Functionality Interactive User Interface Database in the back-end XML and Databases Provision for EDIs Adding Security Features, etc.

For developing the project, students may use the followings:

.NET Platform, J2EE Platform, Eclipse JAVA, C#, VC++, etc. XML, DHTML, CGI, CSS, PHP & MySql, Scripting Languages (JSP, ASP), or Suitable Technologies.

OR

Research Project.

MCA Semester III
MCAE11- Cryptography & Network Security

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the fundamentals of Cryptography. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. To understand the various key distribution and management schemes. To understand how to deploy encryption techniques to secure data in transit across data networks. To design security applications in the field of Information technology.

UNIT-I **Lectures: 11**

Threats & Counter measures, Terminology: Security Objectives and Services, Cryptographic Algorithms and Protocols, Cryptography and Cryptanalysis, Primitives: Symmetric Encryption, Asymmetric Encryption / Signing, Modification Check Values, Random Number Generation, Cryptographic Protocols, Access Control**,** Network Security Integration and Link Layer Security Protocols**,** Basic Design Space of Security Integration, Pragmatic Internet Computing Model and Different Security Requirement Levels.

UNIT-II **Lectures: 11**

Basic Security Deficits of the Internet Protocol, Security Objectives of IPSec, Overview on Concepts: Security Associations, Security Association Database, Security Policy Database, Security Protocols, Transport Mode and Tunnel Mode, Authentication Header (AH), Encapsulating Security Payload (ESP),Authentication and Key Management, Secure Socket Layer / Transport Layer Security (SSL/TLS), Secure Shell (SSH),Basic

UNIT-III **Lectures: 11**

Firewall Concepts, Firewall Architectures, Packet Filtering, Proxy Services and Bastion Hosts, Specific Threats in Mobile Communications, Security of Wireless Local Area Networks, GSM/GPRS/UMTS Security Concepts and Protocols. Conventional Encryption: Classical Techniques; Modern Techniques; Algorithms; Confidentiality Using Conventional Encryption. Public-Key Encryption and Hash Functions: Public-Key Cryptography;

UNIT-IV **Lectures: 12**

Introduction to Number Theory; Message Authentication and Hash functions; Hash and Mac Algorithms; Digital Signatures and Authentication Protocols. Network Security Practice: Authentication applications; Kerberos, X.509 Directory Authentication Service, Electronic Mail Security; Pretty Good Privacy, S/MIME, IP Security; IP Security Architecture, Combining Security Associations, Key Management, Web Security; Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. System Security: Intruders, Viruses and Related Threats. Firewalls, Firewall Design Principles, Trusted Systems.

References:

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
2. AtulKahate, “Cryptography and Network Security”, Tata McGraw Hill.

MCA Semester III
MCAE12- Data Warehousing & Data Mining

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand data warehouse concepts, architecture, business analysis and tools. To understand data pre-processing and data visualization techniques. To study algorithms for finding hidden and interesting patterns in data. To understand and apply various classification and clustering techniques using tools.

UNIT-I **Lectures: 11**

DSS-Uses, definition, Operational Database. Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing, Multi-Dimensional Database Structures. Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.

UNIT-II **Lectures: 11**

DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Warehouse Database. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, Cleanup & Transformation Tools. Metadata.

UNIT-III **Lectures: 11**

Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing (OLAP). Patterns & Models. Statistics. Artificial Intelligence, Knowledge Discovery, Data Mining.

UNIT-IV **Lectures: 12**

Introduction to Data-Mining. Techniques of Data-Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms, Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Web Data- Mining, Mining and Meta-Data. Data Visualization & Overall Perspective. Data Visualization. Applications of Data-Mining.

References:

1. Berson, “Data Warehousing, Data-Mining & OLAP”, Tata Mcgraw-hill Education Pvt. Ltd.
2. Mallach, “Decision Support and Data Warehousing System”, Tata Mcgraw-hill Education.
3. BhavaniThura-is-ingham, “Data-Mining Technologies, Techniques Tools & Trends”, CRC Press

MCA Semester III
MCAE13- Cloud Computing

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To analyze the components of cloud computing showing how business agility in an organization can be created. To compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements. To identify data management, security and privacy issues in cloud computing. To understand the recent research trends in cloud computing.

UNIT-I **Lectures: 11**

Introduction to Cloud Computing: Overview of Computing, Cloud Computing (NIST Model), Properties, Characteristics & Disadvantages, Role of Open Standards; Cloud Computing Architecture: Cloud computing stack, Service Models: Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS); Deployment Models: Public, Private, Hybrid, Community; Service Management in Cloud Computing: Service Level Agreements(SLAs), Cloud Economics.

UNIT-II **Lectures: 11**

Cloud and Virtualization, Virtual machine; Resource Management (RM) in Cloud Computing: Energy-aware RM techniques, SLA-aware RM techniques, Market Oriented RM techniques, Load-Balanced RM techniques, Network Load-Balanced RM techniques.

UNIT-III **Lectures: 11**

Data Management in Cloud Computing: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing; Cloud Security: Infrastructure Security, Data security and Storage, Identity and Access Management, Access Control, Trust, Reputation, Risk.

UNIT-IV **Lectures: 12**

Case Study on Open Source and Commercial Clouds, Cloud Simulator, Research trend in Cloud Computing, Fog Computing.

References:

1. GautamShroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach” McGraw-Hill Osborne Media
3. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, “Cloud Computing: Principles and Paradigms”, Wiley
4. John Rittinghouse& James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press.
5. Smith, Jim, and Ravi Nair, “Virtual machines: versatile platforms for systems and processes”, Elsevier.
6. Recent conference/journal papers as well as documentation from cloud providers.

MCA Semester III
MCAE14- Compiler Design

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: The objectives of this course is to explore the principles, algorithms, and data structures involved in the design and construction of compilers. The course is intended to teach the students the basic techniques that underlie the practice of Compiler Construction. The main objective of this course is to introduce the major concept areas of language translation and compiler design and to develop an awareness of the functions.

UNIT-I **Lectures: 12**

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler

Programming Languages: High level languages, the lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission. **Lexical Analysis:** The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, and Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer

UNIT-II **Lectures: 11**

The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.**Basic Parsing Techniques:** Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC.

UNIT-III **Lectures: 11**

Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, and Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.

UNIT-IV **Lectures: 11**

Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs

References:

1. Alfred V Aho , Jeffrey D. Ullman, “Principles of Compiler Design”, Narosa
2. A.V. Aho, R. Sethi and J.D Ullman, “Compiler: principle, Techniques and Tools”, AW

MCA Semester III
MCAE21- Web Technology

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the concept of Web Application Development and its Architecture. To understand the Essentials of Web Application Development. To understand and practice web page designing techniques. To understand the differences between client side & server side technologies to develop Web Application.

UNIT-I **Lectures: 11**

INTRODUCTION & WEB DESIGN: Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT-II **Lectures: 12**

Basics of HTML, CSS, and JavaScript: HTML and HTML5: Introduction, TML Tags, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms. Cascading Style Sheet (CSS): Introduction, Basics of CSS, style types. JavaScript: Introduction, variables, operators, conditionals, looping and validation. Introduction to Jquery, Ajax and XML.

UNIT-III **Lectures: 11**

PHP: PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP.

UNIT-IV **Lectures: 11**

MYSQL: PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

References:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India.
2. Web Technologies, Black Book, Dreamtech Press.
3. HTML 5, Black Book, Dreamtech Press.
4. Web Design, Joel Sklar, Cengage Learning.

MCA Semester III
MCAE22- Simulation & Modeling

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: The course aims to teach the generic (i.e., tool and application domain independent) concepts of modeling and simulation and predict the performance of an existing or planned system and to compare alternative solutions for a particular design problem.

UNIT I **Lectures: 11**

Topic Proposed Lectures I System definition and components, stochastic activities, continuous 8 and discrete systems, System modeling, Types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

UNIT II **Lectures: 12**

System simulation, Need of simulation, Basic nature of simulation, 8 techniques of simulation, comparison of simulation and analytical methods, types of system Simulation, real time simulation, hybrid simulation, simulation of pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag model, Cobweb model.

UNIT III **Lectures: 11**

Simulation of continuous Systems, analog vs digital simulation, 8 simulation of water reservoir system, simulation of a servo system, simulation of an auto-pilot.Discrete system simulation, fixed timestepvs event-to-event model, generation of random numbers, test of randomness, Monte-Carlo computation vs stochastic simulation.

UNIT IV **Lectures: 11**

System dynamics, exponential growth models, exponential decay 8 models, logistic curves, system dynamics diagrams, world model. Simulation of PERT networks, critical path computation, un-certainties in activityduration, resource allocation and consideration, Simulation languages, object oriented simulation.

Reference:-

1. Geoftrey Gordon, “System Simulation”, PHI 2) NarsinghDeo, “System Simulation with digital computer”, PHI. 3)
2. Averill M. Law, W. David Kelton, “Simulation Modelling and Analysis”,TMH.

MCA Semester III
MCAE23- Software Testing & Quality Assurance

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods. Software testing is an activity which aims at evaluating the quality of Testing ensures the implementation of requirements along with the assurance.

UNIT I **Lectures: 11**

Software Testing and Introduction to qualityIntroduction, Nature of errors, an example for Testing, Definition of Quality, QA, QC, QM andSQA, Software Development Life Cycle, Software Quality Factors ,Verification and Validation: Definition of V &V, Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough,

UNIT II **Lectures: 11**

Software Testing MethodsTesting Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testingand its types ,Software Testing Strategies, Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing,System Testing.

UNIT III **Lectures: 11**

Software MetricsConcept and Developing Metrics, Different types of Metrics, complexity metrics
Defect Management: Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related toDefects, Using Defects for Process ImprovementQuality ImprovementIntroduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts.

UNIT IV **Lectures: 12**

Software Quality AssuranceConcepts, Quality Movement, Background issues and SQA activities Software Reviews, FormalTechnical Reviews, Formal approaches to SQA Statistical Quality Assurance, SoftwareReliability, SQA Plan, The ISO 9001 Quality Standard, Six sigma, Informal Reviews
Quality CostsQuality Cost Measurement, Utilizing Quality Costs for Decision-MakingTesting Tools (Introduction and execution only)Junit, Apache Jmeter, Winrunner, Loadrunner, Rational Robot

References:

1. Software Engineering – A Practitioners Approach, Roger S. Pressman, Tata McGraw Hill
2. Software Engineering for Students- A Programming Approach, Douglas Bell,
3. Pearson Education
4. Quality Management, 5th ed., Prentice-Hall, 2010. Donna C. S. Summers
5. Total Quality Management, Prentice Hall, 2003. Dale H. Besterfield

MCA Semester III
MCAE24- Digital Image Processing

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To describe and explain basic principles of digital image processing. To design and implement algorithms that perform basic image, Ability to learn digital image processing techniques and apply in practical problems.

UNIT-I

Introduction and Fundamentals **Lectures: 11**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, a Simple Image Model, Sampling and Quantization. **Image Enhancement in Frequency Domain** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters– Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters–Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphism Filtering.

UNIT-II **Lectures: 11**

Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions–Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement Using Arithmetic/Logic Operations–Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing- Mean filter, Ordered Statistic Filter; Sharpening– The Laplacia

UNIT-III **Lectures: 11**

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering–Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters– Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering– Band pass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **Lectures: 12**

Morpho logical Image Processing :Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms–Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening. **Registration** Introduction, Geometric Transformation– Plane to Plane transformation, Mapping, Stereo Imaging– Algorithms to Establish Correspondence, Algorithms to Recover Depth **Segmentation** Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresh holding, Local Thresh holding, Region-based Approach, Edge and Line Detection

References:

1. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
2. Digital Image Processing and Computer Vision, R.J. Schalk off .Published by: JohnWiley and Sons,

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MCA Semester IV
MCAE31- Privacy & Security in Online Social Media

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: An exponential increase in the use of online social media and networks on the Internet. Websites like Facebook, YouTube, LinkedIn, Twitter, Flickr, Instagram, Google+, Four Square, Pinterest, Tinder, and the likes have changed the way the Internet is being used. Students would be familiar with Privacy and security of online social media that is current need of society awareness.

UNIT-I **Lectures: 11**
Various privacy and security concerns (spam, phishing, fraud nodes, identity theft) on Online Social Media , Introduction to Social Media API, OSM APIs and tools for data collection, Facebook API. Trust and Credibility on Twitter API,

UNIT-II **Lectures: 12**
Data privacy in the context of social media , Social Tagging Information cascades and social epidemics, Rumors and deception in social media, OSM Misinformation on Social Media, Privacy and Social Media. Internet safety, social networking apps.

UNIT-III **Lectures: 11**
Crime Prevention - Crime and sense of security - Social control and crime prevention -. Community and ... Privacy in online data collection, email, searches, online marketing and advertising, social media threats, MySQL, Mongo DB, Crowdsourcing, Policing and Online Social Media.

UNIT-IV **Lectures: 11**
E-Crime on Online Social Media, Social Network Analysis, Weblog analysis, Cyber laws: IT act 2000 overview.

References:

1. http://www.amazon.com/Programming-Collective-Intelligence BuildingApplications/dp/0596529325
2. http://www.amazon.com/Practical-Web-Applications-Experts-Voice/dp/1590599063
3. http://www.amazon.in/Building-Social-Applications-Gavin-Bell/dp/8184048327?tag=googinhydr18418-21
4. http://www.amazon.in/The-Web-Application-Hackers-Handbookebook/dp/B005LVQA9S?tag=googinhydr18418-21

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MCA Semester IV
MCAE32- Pattern Recognition

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: Students will learn the fundamentals of pattern recognition and its relevance to classical and modern problems. Pattern recognition is the scientific discipline whose goal is the classification of objects into a number of categories or classes. Introduce the student to the basic concepts and methods for the recognition of patterns in data. This is accomplished via the presentation of the underlying theory and algorithmic approaches for the detection and characterization of patterns in multi-dimensional data.

UNIT-I **Lectures: 11**

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learningand adaptation, Pattern recognition approaches, Mathematical foundations–Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II **Lectures: 11**

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density anddiscriminate functions.

UNIT–III **Lectures: 11**

Parameter estimation methods: Maximum- Like lihood estimation, Bayesian Parameter estimation,Dimension reduction methods-Principal Component Analysis(PCA),Fisher Linear discriminate analysis, Expectation-maximization(EM),Hidden Markov Models(HMM), Gaussian mixture models.

UNIT-IV **Lectures: 12**

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbour Estimation,Nearest Neighbor Rule, Fuzzy classification. **Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques:Iterative square-error partitional clustering–K-means, agglomerative hierarchical clustering, ClusterValidation.

References:

1. S.Theodoridis and K.Koutroumbas,"Pattern Recognition",4Edition, Academic Press,
2. RichardO.Duda,PeterE.HartandDavidG.Stork,"PatternClassification",2 Edition, JohnWiley, 2006.

MCA Semester IV
MCAE32-Data Analytics

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To develop problem solving abilities using Mathematics, apply algorithmic strategies while solving problems to develop time and space efficient algorithms and study algorithmic examples in distributed, concurrent & parallel environments present a survey on applications for Business Analytic and Intelligence.

UNIT-I **Lectures: 11**

Introduction and Life Cycle Introduction: Big data overview, state of the practice in Analytics- BI Vs Data Science, Current Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem and new approach. Data Analytic Life Cycle: Overview, phase 1- Discovery, Phase 2- Data preparation, Phase 3-Model Planning, Phase 4- Model Building, Phase 5- Communicate Results, Phase 6-Opearationalize. Case Study: GINA

UNIT-II **Lectures: 11**

Basic Data Analytic Methods, Statistical Methods for Evaluation- Hypothesis testing, difference of means, wilcoxon rank–sumtest, type 1 type 2 errors, power and sample size, ANNOVA. Advanced Analytical Theory and Methods: Clustering- Overview, K means- Use cases, Overview of methods, determining number of clusters, diagnostics, reasons to choose and cautions.

UNIT-III **Lectures: 12**

Association Rules and Regression Advanced Analytical Theory and Methods: Association Rules- Overview, a-priori algorithm, evaluation of candidate rules, case study-transactions in grocery store, validation and testing, diagnostics. Regression- linear, logistics, reasons to choose and cautions, additional regression models. Classification, Decision trees- Overview, general algorithm, Naïve Bayes – Bayes‟ Algorithm, Naïve Bayes‟ Classifier, smoothing, diagnostics. Diagnostics of classifiers, additional classification methods.

UNIT-IV **Lectures: 11**

Big Data Visualization, data visualization tools, Techniques for visual data representations, Advanced Analytics-Technology and Tools Analytics for unstructured data- Use cases, Map Reduce, Apache Hadoop. The Hadoop Ecosystem- Pig, HIVE, HBase, Mahout, NoSQL. An Analytics Project-Communicating, operationalizing, creating final deliverables.

References:

1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publications, 2012, ISBN0-07-120413-X
2. AshutoshNandeshwar , “Tableau Data Visualization Codebook”, Packt Publishing, ISBN 978-1-84968-978-6

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MCA Semester IV
MCAE34- Software Quality Engineering

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the methodologies involved in the development and maintenance of software (i.e.) over the entire life cycle. To learn about generic models of software development process. To understand fundamental concepts of requirements engineering and Analysis Modeling. To understand the different design techniques and their implementation. To learn various testing and maintenance measures. To understand Project management and Quality Assurance plan.

UNIT-I **Lectures: 11**

Software Quality Concept

Software Perspective: Components, Characteristics, Types, Myths; Software Quality Overview: Concepts & Models; Software Quality Measurement and Metrics; Software Quality Assurance: Goals & Responsibilities; SQA Life Cycle & Activities. Value of a Quality Software: User's Perspective.

UNIT-II **Lectures: 11**

Quality Assurance: Planning & Standards

Need for SQA plan: Tools & Techniques; Risk Management; Importance of Software Quality; Quality Standards and Best Practices; SQA Standards: Requirements & Activities; ISO 9000 series for Quality Standards.

UNIT-III **Lectures: 12**

Software Quality Metrics and Models

Software Metrics: Definition & Examples; Quality Metrics: Features & Framework; Development & Selection of Quality Metrics using different approaches.

Need for Good Quality Model; Hierarchical and Non-Hierarchical Quality Models; Characteristics of Quality Models; Capability Maturity Model.

UNIT-IV **Lectures: 11**

Object Oriented Software Design: Quality Metrics & Measurement

Object Oriented Design & Paradigm; Metrics for Object Oriented Software Design & Selection Criterion; Quality Model for Object Oriented Design; Assessment of Object Oriented Design & Quality Attributes.

References:

1. Software Quality: Concept and Practices, R A Khan, K Mustafa, S I Ahson
2. Software Quality Assurance: From Theory to Implementation, Daniel Galin
3. Metrics and Models in Software Quality Engineering, Stephen H. Kan
4. Quality Assurance: Software Quality Assurance Made Easy, Solis Tech

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MCA Semester IV
MCAE41- Neural Network

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence. Understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

UNIT-I **Lectures: 11**

Neuro Computing and Neuroscience 10 Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

UNIT-II **Lectures: 11**

Data processing: Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

UNIT-III **Lectures: 11**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

UNIT-IV **Lectures: 12**

Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning

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MCA Semester IV
MCAE42- Internet of Things

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand the definition and significance of the Internet of Things, discuss the architecture, operation, and business benefits of an IoT solution. Explore the relationship between IoT academia and industries.

UNIT-I **Lectures: 11**

Introduction to Internet in general and Internet of Things: Introduction to Internet: layers, protocols, packets, services; Local Area Networks, MAC level, link protocols such as: point-to-point protocols, Ethernet, Wi-Fi 802.11, cellular Internet access, and Machine-to-Machine (M2M).

UNIT-II **Lectures: 11**

IoT Technology Fundamentals: IoT definitions: overview, applications, potential & challenges, and architecture; Devices and gateways, Local and wide area networking; Data management, Business processes in IoT, Everything as a Service (XaaS), IoT Analytics, Knowledge Management.

UNIT-III **Lectures: 12**

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. IoT examples: Case studies, e.g. sensor bodyarea-network and control of a smart home. IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model Introduction, Reference Model and architecture, IoT reference Model; IoT Reference Architecture.

UNIT-IV **Lectures: 11**

Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.Real-World Design Constraints- Introduction, Technical Design constraints, Data representation and visualization, Interaction and remote control. Uses of IoT in Industrial Automation, Commercial Building Automation, Wireless communication, etc.

References:

1. Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,―From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press.

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MCA Semester IV
MCAE43- Machine learning

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To understand human learning aspects and relate it with machine learning concepts, understand nature of the problem, apply machine learning algorithm and find optimized solution for given problem.

UNIT I **Lectures: 11**

Introduction to Machine learning**,** Classic and adaptive machines, Machine learning matters, beyond machine learning-deep learning and bio inspired adaptive systems, Machine learning and big data. Important Elements of Machine Learning- Data formats, Learnability, Statistical learning approaches, Elements of information theory.

UNIT II **Lectures: 11**

Scikit- learn Dataset, Creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principle Component Analysis(PCA)-non negative matrix factorization, Sparse PCA, Kernel PCA. Atom Extraction and Dictionary Learning.

UNIT III **Lectures: 11**

Linear regression- Linear models, A bi-dimensional example, Linear Regression and higher Dimensionality, Ridge, Lasso and ElasticNet, Robust regression with random sample consensus, Polynomial regression, isotonic regression,Logistic regression-Linear classification, Implementation and Optimizations,Stochastic gradient descendent algorithms.

UNIT IV **Lectures: 12**

Bayes‟ Theorom, Naïve Bayes‟ Classifiers, Vector Machines, and Support Vector Regression.Decision Trees and Ensemble Learning Decision Trees- Impurity measures, Feature Importance. Clustering Fundamentals- Basics, K-means Introduction to Meta Classifier. Hierarchical Clustering, Expectation maximization clustering, Fundamentals of Deep Networks- Defining Deep learning,

References:

1. EthemAlpaydin, “Introduction to Machine Learning”, PHI 2nd Edition-2013, ISBN 978-0-262-01243-0
2. Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of
3. Data”, Cambridge University Press, Edition 2012, ISBN-10: 1107422221; ISBN-13: 978-1107422223
4. Giuseppe Bonaccorso, “Machine Learning Algorithms”, Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622

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MCA Semester IV
MCAE44- Distributed Database Systems

Credit: 04, IA Marks: 30, Final Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE: To enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems.

UNIT-I **Lectures: 11**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recover able and Cascade less schedules.

UNIT–II **Lectures: 11**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multi version Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for locking scheduler.

UNIT-III **Lectures: 12**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol, Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems.

UNIT–IV **Lectures: 11**

Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages. Distributed Query Processing, Multi way Joins, Semi joins, Cost based query optimization for distributed database, and Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

References

1. Garcia-Molina, Ullman, Widom,' Database System Implementation' Pearson Education
2. Silberschatz, korth and Sudershan, DatabaseSystemConcept',McGrawHill