Curriculum & Syllabi

of

Master of Computer Application

(w.e.f. 2018-19)

Vision

Mission

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Overall Credit Structure

Curriculum

Syllabus

Offered By

INFORMATION TECHNOLOGY AND COMPUTER APPLICATION DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY,
GORAKHPUR-273010, UP

August 2021

Program: MCA
Department of ITCA
MMMUT Gorakhpur

Programme Educational Objectives

PEO-1 To inculcate the knowledge of computer fundamentals for developing the ability to formulate, solve and analyse the problems of computer applications and to provide the skills for the pursuit of post-graduate studies and research & development.

PEO-2 To nurture the understanding of prerequisites, technical aspects, and designs for coming up with the novel and efficient solutions for the software development.

PEO-3 To assist the students in the pursuit of successful career by adopting the ethical and moral practices.

PEO-4 To inculcate technical and soft skills required by the national as well as international organizations.

PEO-5 To elevate cognizance in the students toward the lifelong learning with ethical and moral values.

PEO-6 To nurture the students with knowledge of contemporary technologies, practical experiences, and possibilities in the field of computer applications that develops the team spirit and leadership qualities by working on different kinds of projects.

Programme Outcomes

PO-1 The students will develop the ability towards the application of fundamental knowledge of computing, algorithms, and programming for developing the solutions of the problems of computer applications. **(Rudimentary analytical skills)**

PO-2 The post-graduating students will be able to model and carry out the experiments by using the knowledge of computing techniques and derive the conclusions by analysing and interpreting the data. **(Computing skills)**

PO-3 The students will be able to design, analyze, implement, and assess a computer-based information system, procedure, module, or software to fulfill the requirements along with the consideration of economical, privacy and reliability constraints. **(Innovative skills)**

PO-4 To possess knowledge for functioning as a member or team leader effectively in software project development. **(Team spirit)**

PO-5 The students will develop the analytical skills to analyze, recognize, formulate, and devise solutions to the computing problems by using the adequate computing skills and knowledge. **(Problem solving skills)**

PO-6 The students will have the awareness towards the professional, legal, ethical, and moral practices. **(Professional integrity)**

PO-7 The students will have the efficient speaking and written/interpersonal communication skills. **(Oral and written communication skill)**

PO-8 To understand and analyze the local and global consequences of computing solutions ranging from individuals and organizations to the society. **(Computing consequences assessment skills)**

PO-9 To be able to learn from mistakes, adapt new developments, and participate in continuing education opportunities to foster personal and organizational growth and develop the ability to indulge in maintaining professional growth and lifelong learning. **(Continuing education cognizance)**

PO-10 To have the cognition towards the current issues and the problems of the society. **(Societal awareness)**

PO-11 To possess the ability to utilize the knowledge of innovative programming and computing equipment required for the problem-solving tasks. **(Pragmatic skills)**

PO-12 To have the ability to apply the design and evolution precepts in the development of software systems as interface for hardware. **(Software- hardware interface)**

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO-1 To produce the software professionals with decision-making, design, development, and analysis skills having knowledge of latest technology.

PSO-2 To produce software professionals who can apply engineering principles and practices to provide software solutions.

PSO-3 To nurture with knowledge of designing and developing solutions in the areas of networking and web-based computational systems under realistic constraints.

PSO-4 To develop the strong analytical ability, innovative thinking to make them worth for IT industry.

PSO-5 To develop the skill of implementing the interdisciplinary application software projects to meet the demands of industry requirements using latest tools and technologies.

PSO-6 To promote the PG students for research work, higher studies, and lifelong learning.

PSO-7 To develop professional skills and latest technical knowledge time to time by conducting Board of Studies (BOS), updating syllabus to keep pace with the demands of industries for maximising the employability.

MASTER OF COMPUTER APPLICATION
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for Master of Computer Application

(For newly admitted students from Session 2014-2015)

Category ↓	Semesters →	I	II	III	IV	V	VI	Total
Basic and Applied Maths (BAM)		8						**8**
Department Core (DC)		9	24	26	18	14		**91**
Management (M)		4	3					**7**
Humanities & Social Science Core (HSSC)		5						**5**
Project (P)							14	**14**
Program Electives (PE)					8	8		**16**
	Total	**26**	**27**	**26**	**26**	**22**	**14**	**141**

Curriculum for Master of Computer Application

Freshman Year, Semester I

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	DC	MCA-101	Computer Programming with C	3	1	2	5
2.	BAM	MMS604 /MAS105	Applied Probability & Statistics	3	1	0	4
3.	DC	MCA-103	Computer Organization & Architecture	3	1	0	4
4.	M	MBA-102	Accounting & Financial Analysis	3	1	0	4
5.	HSSC	MAS-103	Communication for Business & Management	3	1	2	5
6.	BAM	MAS-106	Discrete Mathematics	3	1	0	4
7.	AC	MAS-108	Behavioural Psychology	2	1	0	-
			Total	**18**	**6**	**4**	**26**

Freshman Year, Semester II

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	DC	MCA-105	Object Oriented Programming with C++	3	1	2	5
2.	DC	MCA-102A	Data Structures & Applications	3	1	2	5
3.	DC	MCA-106	Operating System Concepts	3	1	2	5
4.	DC	MCA-107	Introduction to Database Management Systems	3	1	2	5
5.	DC	MCA-108	Information Security & Cyber Laws	3	1	0	4
6.	M	MBA-101	Fundamentals of Management	2	1	0	3
7.	AC	BAS-24	Applied Computational Methods	3	1	2	-
			Total	**17**	**6**	**8**	**27**

Sophomore Year, Semester III

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	DC	MCA-120	Object Oriented Analysis & Design	3	1	2	5
2.	DC	MCA-121	Computer Graphics & Multimedia	3	1	2	5
3.	DC	MCA-122	Software Engineering	3	1	0	4
4.	DC	MCA-123	Introduction to Computer Network	3	1	2	5
5.	DC	MCA-124	Introduction to Web Technology	3	1	2	5
6.	DC	MCA-125	Mini Project lab	0	0	4	2
7.	AC	MAS-104	Operations Research for Business Decisions	3	1	0	-
			Total	**15**	**5**	**12**	**26**

Sophomore Year, Semester IV

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	DC	MCA-126	Java Programming	3	1	2	5
2.	DC	MCA-127	Linux Administration & Shell Programming	3	1	2	5
3.	DC	MCA-128	Soft Computing	3	1	0	4
4.	DC	MCA-129	Algorithms Design and Analysis	3	1	0	4
5.	PE1	MCA-***	Programme Elective-1	3	1	0	4
6.	PE2	MCA-***	Programme Elective-2	3	1	0	4
7.	AC	MCA-130	Seminar	0	0	6	-
			Total	**18**	**6**	**4**	**26**

Senior Year, Semester V

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	DC	MCA-136	Introduction to Wireless & Mobile Computing	3	1	2	5
2.	DC	MCA-137	.NET Framework & C#	3	1	2	5
3.	DC	MCA-138	Artificial Intelligence: Principles and Techniques	3	1	0	4
4.	PE3	MCA-***	Programme Elective-3	3	1	0	4
5.	PE4	MCA-***	Programme Elective-4	3	1	0	4
6.	AC	MCA-140	Industrial/Practical Training	0	0	2	-
			Total	**15**	**5**	**4**	**22**

Senior Year, Semester VI

S.N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	P	MCA-150	Project	0	0	28	14
			Total	**0**	**0**	**28**	**14**

Computer Applications Fundamentals & Core

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
		MCA - I Year					
1.	MCA-101	Computer Programming with C	-	3	1	2	5
2.	MCA-102A	Data Structures & Applications	-	3	1	2	5
3.	MCA-103	Computer Organization & Architecture	-	3	1	0	4
4.	MCA-105	Object Oriented Programming with C++	-	3	1	2	5
5.	MCA-106	Operating System Concepts	-	3	1	2	5
6.	MCA-107	Introduction to Database Management Systems	-	3	1	2	5
7.	MCA-108	Information Security & Cyber Laws	-	3	1	0	4
		MCA – II Year					
8.	MCA-120	Object Oriented Analysis & Design	-	3	1	2	5
9.	MCA-121	Computer Graphics & Multimedia	-	3	1	2	5
10.	MCA-122	Software Engineering	-	3	1	0	4
11.	MCA-123	Introduction to Computer Network	-	3	1	2	5
12.	MCA-124	Introduction to Web Technology	-	3	1	2	5
13.	MCA-125	Mini Project lab	-	0	0	4	2
14.	MCA-126	Java Programming	-	3	1	2	5
15.	MCA-127	Linux Administration & Shell Programming	-	3	1	2	5
16.	MCA-128	Soft Computing	-	3	1	0	4
17.	MCA-129	Algorithms Design and Analysis	-	3	1	0	4
		MCA – III Year					

18.	MCA-136	Introduction to Wireless & Mobile Computing	-	3	1	2	5
19.	MCA-137	.NET Framework & C#	-	3	1	2	5
20.	MCA-138	Artificial Intelligence: Principles and Techniques	-	3	1	0	4
21.	MCA-140	Industrial/Practical Training	-	0	0	2	-
22.	MCA-150	Project	-	0	0	28	14

Program Electives (Semester IV & Semester V)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
		Semester IV (PE1 & PE2)					
1.	MCA-151	Big Data Technologies	DBMS	3	1	0	4
2.	MCA-152	Data warehousing & Data Mining	DBMS	3	1	0	4
3.	MCA-153	Advanced Topics in Software Engineering	-	3	1	0	4
4.	MCA-154	Digital Image Processing	-	3	1	0	4
5.	MCA-155	Real Time Systems	-	3	1	0	4
6.	MCA-156	Fault Tolerant Systems	-	3	1	0	4
	MCA-157	Introductory course on Compiler Design	-	3	1	0	4
7.	MCA-158	Distributed Database Systems	DBMS	3	1	0	4
		Semester V (PE3 & PE4)					
8.	MCA-159	Distributed Computing	-	3	1	0	4
9.	MCA-160	Software Architecture and Project Management	-	3	1	0	4
10.	MCA-161	Programming in Python	-	3	0	2	4
11.	MCA-162	Cloud Computing	-	3	1	0	4
12.	MCA-163	Advanced Concepts in Database Systems	DBMS	3	1	0	4
13.	MCA-164	Advanced Computer Networks	-	3	1	0	4
	MCA-165	Modern Networking Concepts	-	3	1	0	4
14.	MCA-166	Principles of User Interface Design	-	3	1	0	4
15.	MCA-167	TCP/IP Programming	-	3	1	0	4

SYLLABI

MCA-101 COMPUTER PROGRAMMING WITH C

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Develop a C program that contains sequence, selection and iteration control structures
2. Develop a C program that is able to read and respond to user input
3. Given a problem definition/specification the student will design, code, debug and provide the instructor with an executable program that fulfills the specification.
4. Develop a C program that contains functions and parameters
5. Students will be able to read, understand and trace the execution of programs written in C language.
6. For a given algorithm students will be able to write the C code using a modular approach.

Topics Covered

UNIT I **9**

Introduction to Programming: Use of high level programming language for the systematic development of programs, Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic Standard I/O in "C",

Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity

UNIT II **9**

C Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue

UNIT III **9**

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays
Structures: Purpose and usage of structures, declaring structures, assigning of structures,
Strings: String variable, String handling functions, Array of strings
Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.
Storage classes: Auto, Extern, register and static variables

UNIT IV **9**

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers, Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

The Pre-processor directives, command line arguments, Macros

EXPERIMENTS:

A sample sequence of topics and lab classes for the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching

4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Linked lists
10. Data structures

Books & References:

1. Problem Solving and Program Design in C, 7/e Jeri R. Hanly, Elliot B. Koffman Pearson
2. Complete reference with C Tata McGraw Hill
3. The C programming language : Kerninghan and Ritchie Prentice Hall

MMS-604/ MAS-105 **APPLIED PROBABILITY AND STATISTICS**

Course category : Basic Sciences & Maths (BSM)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course

1. Use of moments and kurtosis to find the type of curve.
2. Choose a statistical method for solving practical problems
3. To understand the meaning and importance of correlation and regression analysis including both simple and multiple correlation and regression.
4. To have a proper understanding of Statistical applications in Economics and Management.

Topics Covered

UNIT-1

Probability and Distributions: Definition of probability, Addition and Multiplication Laws of probability, Conditional Probability, Baye's Theorem, Binomial Distribution, Poisson's Distribution, Normal Distribution. Problems related to Binomial, Poisson and Normal Distributions. 9

UNIT-II

Statistical Techniques I: Moments, Moment Generating function, Skewness, Types of Skewness, Measurement of Skewness, Kurtosis and its types. Curve fitting: Method of Least Squares, Fitting of Straight lines, Fitting of Parabola of second degree. 9

UNIT-III

Correlation and Regression: Correlation, Correlation coefficient, Spearman's rank correlation coefficient, Regression, Equation of regression lines, linear, non-linear and multiple regression analysis. Relation between Regression Analysis and Correlation Analysis. 9

UNIT-IV

Sampling Theory: Sampling, Tests of Significance, Chi-square test, t-test, Application to Engineering. Time series and fore casting, Statistical quality Control methods, Control charts, $\bar{x}, R, p, np$ *and* $C-$ *charts*. 9

Books & References

1. B.S. Grewal; Higher Engineering Mathematics, Khanna Publishers, Delhi.
2. H.K. Dass and Rama Verma; Engineering Mathematics, Vol.III, S. Chand and Co. Ltd., New Delhi.
3. B.V. Ramana; Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi.

MCA-102A DATA STRUCTURE & APPLICATIONS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand the various techniques of sorting and searching
2. To design and implement arrays, stacks, queues, and linked lists
3. To understand the complex data structures such as trees and graphs

Topics Covered

UNIT- I: **9**

Linear Data Structure Introduction: Need of data structure, Concepts a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code, Algorithm efficiency and analysis, time and space analysis of algorithms – order notations Array: Different representations – row major, column major. Sparse matrix - its implementation and usage, Array representation of polynomials Linked List: Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

UNIT- II **9**

Stack and Queue: Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications Recursion: Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle

UNIT- III **9**

Nonlinear Data structures Trees: Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B-Trees – operations (insertion, deletion with examples only). Graph definitions and concepts Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS, applications. Minimal spanning tree – Prim‘s algorithm (basic idea of greedy methods).

UNIT IV **9**

Searching, Sorting: Sorting Algorithms: Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. Searching: Sequential search, binary search, interpolation search Hashing: Hashing functions, collision resolution techniques.

EXPERIMENTS:

Write C/C++ Programs to illustrate the concept of the following:

1. Arrays
2. Linked List
3. Stack
4. Queue
5. Graph
6. Tree
7. Searching & Sorting Algorithms

Books & References:

1. Data Structures and Program Design In C, 2/E by Robert L. Kruse, Bruce P. Leung.
2. Data Structures in C by Aaron M. Tenenbaum.
3. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
4. Data Structures by S. Lipschutz.
5. Data Structures Using C by Reema Thareja.
6. Data Structure Using C, 2/e by A.K. Rath, A. K. Jagadev.
7. Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein

MCA-103 COMPUTER ORGANISATION & ARCHITECTURE

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To impart the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles
2. To provide an overview on the design principles of digital computing systems
3. To provide technical knowledge about various digital hardware components
4. To understand how computers are constructed out of a set of functional units and how the functional units operate, interact, and communicate

Topics Covered

UNIT I **9**

Data Representation, Binary, Octal, HEX and their inter-conversion, 1's and 2's complement, Binary Arithmetic, Number Systems – BCD, EBCDIC, ASCII.Basic Gates & its Truth tables, Boolean algebra, Fundamental concepts of Boolean algebra, Basic Theorem and properties of Boolean algebra, Boolean functions, Canonical and standard forms, Sum Of Product, Product of Sum, K-map method (up to 4 variables), don't care conditions, Combination circuit design with AND, OR, NOT, NAND, NOR gates, Exclusive-OR and Equivalence Functions, Universal gates functionality

UNIT II **9**

Combinational Circuits: Half Adder, Full Adder, Binary Adder and Subtracter, Decoder / Encoder, Multiplexer / Demultiplexer.

Sequential Circuits: Flip Flops - SR, D, JK, Master – Slave, Edge Triggered, Shift Registers, Synchronous Counter and Asynchronous Counter.

UNIT III **9**

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation, Arithmetic Logic Shift Unit, Design of Fast address, IEEE standard for Floating point numbers. Control Design: Hardwired & Micro Programmed Control Unit.

Processor Design: Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

UNIT IV **9**

Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output Processor, Serial Communication.

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary memory, Cache memory, Virtual Memory.

Books & References:

1. Digital Design by M Morris Mano, M D Ciletti
2. Computer System Architecture, by M. Mano
3. Computer Organization, by Vravice, Zaky & Hamacher

MMS-605	**DISCRETE MATHEMATICS**
Course category	: Basic Sciences & Maths (BSM)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course

1. Use logical notation to define different function such as set, function and relation.
2. Use of basic properties of group theory in computer science.
3. Use of graph theory models to solve problems of connectivity and constraint satisfaction, for example, scheduling.
4. Use of induction hypotheses to prove formulae.

Topics Covered

UNIT-1

Set Theory, Relation and Function: Definition of sets, Countable and uncountable sets, Venn Diagrams, Proofs of some general identities on sets. Definition and types of relation, composition of relation, equivalence relation, partial order relation. Function: Definition, types of function, one to one, into and onto function, inverse function, composition of functions. 9

UNIT-II

Algebraic Structures: Definition, properties and types of algebraic structures, Semi groups, Monoid, Groups, Abelian group, properties of groups, Subgroups, Cyclic groups, Cosets, Factor group, Permutations groups, Normal subgroups, Homomorphism and Isomorphism of groups, examples and standard results. Rings and fields: Definition and Standard results. 9

UNIT-III

Graphs: Simple graph, multigraph, graph terminology, representation of graphs, Bipartite, regular, planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, graph colouring, chromatic number, chromatic polynomials. Tree: types and definition, rooted tree, properties of trees. 9

UNIT-IV

Combinatorics: Basic counting Technique, Pigeon-hole principle, Discrete Numeric function, Recurrence relations and their solution, Generating function, Solution of recurrence relations by method of generating function. Polya's Counting theorem. 9

Books & References

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with applications to computer science, McGraw Hill 1975.
2. Deo Narsingh, Graph Theory with application to engineering and computer science" by Prentice Hall, Englewood Cliffs, N.J. 1974.
3. V. Krishnamurthy, Combinatorics: Theory and applications, East-west press Pvt. Ltd. New Delhi.

MCA-105 OBJECT ORIENTED PROGRAMMING WITH C++

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand object oriented programming and advanced C++ concepts.
2. Be able to program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
3. Be able to build C++ classes using appropriate encapsulation and design principles.

Topics Covered

UNIT I **9**

Object Oriented Programming Paradigm, Basic Concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined and Derived Data Types, Type Compatibility, Reference, Variables, Scope Resolution Operator, Type Casting, Implicit Conversion, Operator Precedence, Control Structures, Structure, Function.

UNIT II **9**

Class specification, class objects, accessing class members, data hiding, empty classes, pointers within a class, passing objects as arguments, returning objects from functions, friend functions and friend classes, constant parameters and member functions, structures and classes, static members, objects and memory resource, class design steps. Constructors, destructor, constructor overloading, order of construction and destruction, constructors with default arguments, nameless objects, dynamic initialization through constructors, constructors with dynamic operations, constant objects and constructor, static data members with constructors and destructors, nested classes.

UNIT III **9**

Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings Using Operators, Rules for Overloading Operators, Type Conversions, Deriving Derived Classes, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, constructors & destructors in derived classes, constructor's invocation and data members initialization, Virtual Base Classes, Abstract Classes.

UNIT IV **9**

Pointers to Objects, Classes for File Stream Operations, Opening and Closing a File, File Pointers and their Manipulations, Sequential Input and Output Operations.

Class Templates with multiple parameters, Function Templates, Overloading of Template Functions, Member Function Templates.

EXPERIMENTS:

Write C++ Programs to illustrate the concept of the following:

1. Arrays
2. Structures
3. Pointers
4. Objects and Classes
5. Console I/O operations
6. Scope Resolution and Memory Management Operators
7. Inheritance
8. Polymorphism
9. Virtual Functions
10. Friend Functions
11. Operator Overloading
12. Function Overloading
13. Constructors and Destructors
14. this Pointer
15. File I/O Operations
16. Assignments on developing interfaces- multiple inheritance, extending interfaces

17. Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming

Books & References:

1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
2. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint
3. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.
4. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication 1994.
5. E. Balagurusamy,"Object Oriented Programming with C++", TMH Publication.
6. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education.
7. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", Fourth Edition, Pearson Education 2005.
8. Timthy Budd, "An Introduction to Object Oriented Programming with C++," Addition-Wesley.
9. Kip R. Irvine," C++ and Object-Oriented Programming," Prentice Hall.

MCA-106 OPERATING SYSTEM CONCEPTS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. List and define the fundamental concepts of Operating System
2. Implement the various CPU scheduling, Disk scheduling algorithms and compare their performance
3. Simulate the given problem

Topics Covered

UNIT I **9**

Introduction: Basic architectural concepts, Operating System Services, interrupt handling, concepts of batch-processing, multiprogramming, time-sharing, real-time operations; Resource Manager view, process view and hierarchical view of an OS.

Memory management: Partitioning, paging, concepts of virtual memory demand paging, page replacement algorithms, segmentation, Segmentation and demand-paging, Cache memory management.

UNIT II **9**

Processor management: CPU scheduling – short-term, medium term and long term scheduling, non-preemptive and preemptive algorithms, performance analysis of multiprogramming, multiprocessing and interactive systems, Concurrent processes,

precedence graphs, critical section problem, semaphores; Classical process, co-ordination problems, Producer-consumer problem, Reader-writer problem, Dining philosophers problem, Barber's shop problem, Interprocess communication.

UNIT III **9**

Concurrent Programming: Critical region, conditional critical region, monitors, Deadlocks: prevention, avoidance, detection and recovery. Device Management: Scheduling algorithms – FCFS, shortest-seek-time-first, SCAN, C-SCAN, LOOK, C-LOOK algorithms, spooling, spool management algorithm.

UNIT IV **9**

Information Management: File concept, file support, directory structures, symbolic file directory, basic file directory, logical file system, physical file system, access methods, file protection, file allocation strategies. Protection: Goals, policies and mechanisms, domain of protection, access matrix and its implementation, access lists, capability lists, Lock/Key mechanisms, passwords, dynamic protection scheme, security concepts and public and private keys, RSA encryption and decryption algorithms.

A case study: A UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

EXPERIMENTS:

1. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
2. Process: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. Signal: signal handling, sending signals, signal interface, signal sets.
4. To design and implement the scheduling algorithms.
5. Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

Books & References:

1. A. Silberschatz and P. B. Galvin: Operating Systems Concepts, 5th ed., John Wiley and Sons, New York, 1998.
2. J. L. Peterson and A. Silberschatz: Operating Systems Concepts, Addison-Wesley, Reading, Mass., 1987.
3. P. B. Hansen: Operating System Principles, Prentice Hall, Englewood Cliffs, 1980.
4. A. S. Tannenbaum: Modern Operating Systems, Prentice Hall, Englewood Cliffs, 1992.
5. S. E. Madnick and J. J. Donovan: Operating Systems, McGraw Hill, New York

MCA-107 INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. list and define the fundamental concepts of database management system.
2. manually execute a given (simple) database design a transaction over it.
3. manually infer the type of a given (simple) database transaction.
4. implement (simple) algorithms and data structures as database transaction.
5. design (large) databases that are modular and have reusable components.
6. explain on a simple problem how to apply concurrency control over concurrent database transactions.

Topics Covered

UNIT I **9**

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base 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, relationships of higher degree.

UNIT II **9**

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 types 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 in SQL. induction over
Trees.

UNIT III **9**

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

UNIT IV **9**

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Concurrency Control Techniques:** Concurrency control, locking techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

EXPERIMENTS:

1. Exercises to be based on Sybase / Oracle / Postgres / VB / Power Builder / DB2 / MS-Access.
2. Applications involving vendor development systems, stores management system, finance management etc.
3. Creation and querying of database tables for following cases. .
   a. Write SQL queries using logical operations (=,<,>,etc)
   b. Write SQL queries using SQL operators
   c. Write SQL query using character, number, date and group functions
   d. Write SQL queries for relational algebra
   e. Write SQL queries for extracting data from more than one table
   f. Write SQL queries for sub queries, nested queries
   g. Write programme by the use of PL/SQL
   h. Concepts for ROLL BACK, COMMIT & CHECK POINTS
   i. Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
   j. Create FORMS and REPORTS
4. Design of tables by normalization and dependency analysis.
5. Writing application software with host language interface

Books & References:

1. Date C J, “An Introduction To Database System”, Addision Wesley.
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill.
3. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley.
4. Leon & Leon, “Database Management System”, Vikas Publishing House.
5. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication.
6. Majumdar & Bhattacharya, “Database Management System”, TMH.
7. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill.
8. Kroenke, “Database Processing: Fundamentals, Design and Implementation”, Pearson Education.
9. Maheshwari Jain, “DBMS: Complete Practical Approach”, Firewall Media, New Delhi.

MCA-108 INFORMATION SECURITY AND CYBER LAWS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. list and define the fundamental concepts of Information Security and Cyber Laws.
2. manually solve a given (simple) Information Security problem to satisfy Cyber Laws.
3. manually infer the type of a given (simple) Information Security and Cyber Laws.
4. implement (simple) algorithms and data structures for Information Security and Cyber Laws.
5. design (large) solution for Information Security and Cyber Laws that are modular and have reusable components.
6. explain on a simple problem how Information Security and Cyber Laws are relevant.

Topics Covered

UNIT I **9**

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Concepts in Internet and World Wide Web: Brief review of Internet Protocols-TCP/IP, IPV4, IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques

UNIT II **9**

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. Security Threats to e-Commerce, Virtual Organization, Business Transactions on Web, e-Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges Framework for Information Security, ISO 27001, SEE-CMM, Security Metrics, Information Security Vs Privacy

UNIT III **9**

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.

UNIT IV **9**

Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.

Books & References:

1. Godbole," Information Systems Security", Willey
2. Merkov, Breithaupt, " Information Security", Pearson Education
3. Yadav, "Foundations of Information Technology", New Age, Delhi
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill
5. Sood,"Cyber Laws Simplified", Mc Graw Hill
6. Furnell, "Computer Insecurity", Springer
7. IT Act 2000

MMS-607 APPLIED COMPUTATIONAL METHODS

Course category : Basic Sciences & Maths (BSM)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits : 5
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To find the root of a curve using Bisection, Regula falsi Newton's Method.
2. Use of moments and kurtosis to find the type of curve.
3. To interpolate a curve using Gauss, Newton's interpolation formula.
4. To find the derivative of a curve.
5. To find the area of a curve.

Topics Covered

UNIT-I 9

Numerical Methods: Solution of algebraic and Transcendental equations, Bisection method, Method of False position (Regula-Falsi method) and Newton-Raphson method, Solution of linear simultaneous equations; Guass-Siedel method, Crout's method.

UNIT-II 9

Interpolation and Numerical Integration: Interpolation: Finite Differences, Difference operators, Newton's forward and backward interpolation formulae, Lagrange's formula for unequal intervals, Newton's divided difference formula for unequal intervals. Numerical Integration: Trapezoidal Rule, Simpson's one-third and three-eight rules.

UNIT-III 9

Numerical Solution of Ordinary Differential Equations and Difference Equations: Picard's method, Taylor's Series method, Euler's method, Modified Euler's method, Runge-Kutta method of order four. Difference equations and their solutions. Rules for finding the particular integral.

UNIT-IV 9

Statistical Methods and Probability Distributions: Frequency Distributions, mean, mode, median, standard deviation, Moments, Skewness, Kurtosis, Types and measurement of Skewness and Kurtosis. Correlation; Regression and regression lines. Binomial Distribution, Poisson's Distribution, Normal Distribution.

Experiments

1. To implement Regula-Falsi method to find root of algebraic equation.
2. To implement Newton-Raphson method to find root of algebraic equation.
3. To implement Newton's Divided Difference formula to find value of a function at a point.
4. To implement Numerical Integration by using Simpson's one-third rule.
5. To implement numerical solution by using Runge-Kutta method of order four to find solution of differential equation.
6. To implement numerical solution of differential equation by Picard's method.
7. To implement numerical solution of differential equation by using Euler's method.
8. To estimate regression equation from sampled data and evaluate values of standard deviation, regression coefficient.

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers.

MCA-120 OBJECT ORIENTED ANALYSIS & DESIGN

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the concepts of various design models for several real-world applications
2. Analyze the OMT and UML modelling techniques
3. Design applications in different domains using object-oriented programming

Topics Covered

UNIT I **9**

Fundamentals: Models: Principles of modeling, Importance of modeling, Abstraction; Object Modeling Techniques (OMT): Object Model, Dynamic Model, Functional Model; Unified Modelling Language (UML): Structural Modelling, Behavioral Modelling, Architectural Modelling; Object Oriented Design: Software Development Life Cycle, Object-Oriented Programming Languages, Dominant features of C++, Java and C#, Object Oriented Database design, Modern object-oriented technologies and web services.

UNIT II **9**

Object Model: Object and Classes, Links and Association, Multiplicity, Aggregation, Generalization and Inheritance, Recursive Aggregates, Abstract Class, Multiple Inheritance, Candidate Keys, Constraints: Constraints on objects, Constraints on links, General Constraints, Class and Object Diagram, Class, Attributes and Methods

UNIT III **9**

Dynamic Model: Events and states, Scenario and event traces, Characterization of a state, State diagram, One shot state diagram, Guard condition, Operations: activity and action, Nested State Diagrams: state generalization, event generalization, Concurrency: aggregation concurrency, Advanced Dynamic Modeling Concepts

UNIT IV **9**

Functional Model: Data flow diagrams: Process, Actor, Data Store, Data Flow, Control Flow; Nested DFD; Relation of functional model with object and dynamic models

Some UML Diagrams: Use Case Diagram, Interaction Diagram, Sequence Diagram, Activity Diagram, Component Diagram, Deployment Diagram, Package Diagram

EXPERIMENTS:

A. Implement all the models studied in class taking suitable examples

B. Analyze, Design and Model the following Systems using Object Oriented Methodology (one for a batch of three students)

1. ATM (Automated Teller Machine) System
2. Online Reservation System
3. Online Quiz System
4. Stock Maintenance System
5. Course Registration System
6. Payroll System
7. Expert System
8. Library Management System
9. Real Time Scheduler
10. Online Purchase System

Books & References:

1. James Rumbaugh et al, "Object-Oriented Modeling and Design", Prentice Hall
2. James Rumbaugh et.al., "Object-Oriented Modeling and Design with UML", Pearson
3. Atul Kahate, "Object Oriented Analysis & Design", The McGraw Hill Education
4. James Rumbaugh et.al., "The Complete UML Training Course", Prentice Hall

MCA-122 SOFTWARE ENGINEERING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Enhance the Software Project Management skills.
2. Develop functioning software which benchmarks to the international standards.

Topics Covered

Unit I **9**

Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

Unit II **9**

Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented
software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, user interface design. Coding standards and Code review techniques

Unit III **9**

Fundamentals of testing, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, White box and black box testing, Alpha and Beta Testing of Products, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics.

Unit IV **9**

Software Maintenance and Software Project Management, Software as an evolutionary entity, need for maintenance, categories of maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Books & References:

1. R. S. Pressman, "Software Engineering - A practitioners approach", III Edition, McGraw Hill International editions, 1992.
2. IAN Sommerville, “Software Engineering”, Pearson Education Asia, VI Edition, 2000.
3. Pankaj Jalote, “An Integrated Approach to software Engineering”, Springer Verlag, 1997.

MCA-123 INTRODUCTION TO COMPUTER NETWORK

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the concepts of communication architecture and protocols
2. Identify different types of communication mediums and techniques
3. Define and identify different types of multiplexing, data encoding, modulation, and switching techniques
4. Illustrate different standards of Local Area Network in terms of technologies and hardware used
5. Illustrate network addressing and analysis techniques
6. Understand the Wide Area Network technologies
7. Understand the network routing concepts
8. Understand the internetworking concepts and architectures
9. Understand the TCP/IP protocols and design architectures

Topics Covered

Unit-I **9**

Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, LAN Inter connection devices, Integrated services digital networks.

Unit-II **9**

Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, FDDI, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, High Level Data Link Control

Unit-III **9**

Network Layer: Packet switched networks – IP – ARP – RARP –DHCP – ICMP – Queuing discipline – Routing algorithms,congestion control algorithms, internetworking, TCP/IP protocol, IP addresses, IPv4 and IPv6.

Unit-IV **9**

Transport Layer: Design issues, connection management, Internet Transport Protocol (UDP), Transmission Control Protocol. (TCP) -Adaptive Retransmission - Congestion control ,Congestion avoidance – QoS.
Application Layer: Domain Name System,Electronic mail **(Email),** File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls).

EXPERIMENTS:

1. To create scenario and study the performance of CSMA/CD protocol through simulation.
2. To create scenario and study the performance of token bus and token ring protocols through simulation.
3. Implementation of Error detection and correction algorithms.
4. Implementation and study of 1-bit sliding window viz., stop and wait protocol.
5. Implementation and study of Go back-N protocol.
6. Implementation and study of selective repeat protocol.
7. To get the MAC or Physical address of the system using Address Resolution Protocol.
8. Implementation of distance vector routing algorithm.
9. Implementation of link state routing algorithm.
10. To write a client-server application for chat using TCP.
11. To write a C program to develop a DNS client server to resolve the given hostname.

Books & References:

1. Data Communication and Networking by Forouzan TMH
2. A. S Tanenbaum, Computer Networks, 4th, Edition", Pearson education
3. Data and Computer Communication by W. Stallings, Macmillan Press
4. Computer Networks & Internet with Internet Applications by Comer Pearson Education
5. Computer Networks with Internet Protocols by W Stallings, Pearson Education
6. Local and Metropolitan Area Networks by W Stallings, VIth edition, Pearson Education

MCA-124 INTRODUCTION TO WEB TECHNOLOGY

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify common design mistakes when creating a web based application.
2. Discuss the process of editing a web page using text editors and web page editors
3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer

4. Demonstrate an understanding of basic CSS, XML,JavaScript, JSP, ASP.NET and AJAX

Topics Covered

UNIT I **9**

Introduction to WWW: The World Wide Web, WWW Architecture, Web Search Engines, Web crawling, Web indexing, Web Searching, Search engines optimization and limitations, Web Mining: Web Content Mining, Web Structure Mining, Web Usage Mining

UNIT II **9**

Markup language basics:SGML, HTML, CSS and XML

SGML: Standard Generalized Markup Language (SGML) -Structures, Elements, Content models, DTD, attributes entities.

HTML: Designing web pages with HTML-use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages.

CSS: Use of Cascading Style Sheet in web pages.

XML: Extensible Markup Language (XML): Introduction-using user-defined tags in web pages, displaying XML contents, XML DTDs,use of XSL

UNIT III **9**

Client-Side Scripting using JavaScript: JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects

UNIT IV **9**

Server-side scripting using JSP, **ASP.NET and AJAX, JSP :** Introduction to JSP, JSP Architecture, JSP Directives, JSP scripting elements, Default objects in JSP, JSP Actions, JSP with beans and JSP with Database, Error handling in JSP, Session tracking techniques in JSP, Introduction to custom tags.

ASP.NET : ASP.Net Coding Modules, ASP.NET Page Directives, Page events and Page Life Cycle , PostBack and CrossPage Posting ASP.NET server Controls , HTML Controls, Validation Controls, Building Databases .

AJAX :ASP.NET- AJAX ControlsThe ScriptManager Control , The ScriptManagerProxy Control , The Timer Control , The UpdatePanel Control , The UpdateProgress Control

EXPERIMENTS:

1. Create a HTML static web page which shows the use of different tags in that.
2. Insert an image and create a link such that clicking on image takes user to other page.
3. Prepare a sample code to illustrate three types of lists in HTML.
4. Use tables to provide layout to your HTML page describing your university infrastructure.
5. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
6. Create a simple form that will show all the INPUT METHODS available in HTML.
7. Create a sample code to illustrate the Embedded, External and Inline style sheets for your web page.
8. Write an XML example of given tree that demonstrates the creation of user-designed tags and display it in a browser. fname, lname, joindate, bdate, college, employee, age, salary (with at least 3 elements).
9. Write a program in XML for creation of DTD which specifies a particular set of rules.
10. Write any three programs based on Servlets/Applets.

Books & References:

1. Web Technologies, 1/e -Uttam K. Roy ,Oxford University Press, USA,ISBN-10: 0198066228
2. Web Technology: Theory and Practice -M. Srinivasan, Pearson Education India, ISBN: 9788131774199
3. Deitel, Deitel and Nieto, Internet and Worldwide Web - How to Program, 5th Edition, PHI, 2011.
4. Developing Web Application- Second Editon - Ralph Moseley & M. T. Savaliya, Wiley
5. Web Programming Step by Step, Stepp/Miller/Kirst, 2nd edition, 2009, ISBN:978-1-105-57878-6
6. Java Server Pages –Hans Bergsten, SPD O'Reilly.
7. www.w3c.org
8. www.w3schools.com

MMS-608 OPERATIONS RESEARCH FOR BUSINESS DECISIONS

Course category: Basic Sciences & Maths (BSM)

Pre-requisite Subject : NIL
Contact hours/week: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4

Course Assessment methods: Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify and develop operational research models from the verbal description of the real system.
2. Be able to build and solve Transportation Models and Assignment Models.
3. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry
4. Aware with the basic concepts and tools of game theory and can apply these tools to real-life situations.

Topics Covered

UNIT-1
Linear Programming: Definitions and scope of Operation Research (OR), OR model, Solving 9 OR model. Two variable Linear Programming model and graphical method of solution, Simplex method, Dual Simplex method, Special cases of linear programming.

UNIT-II
Transportation Problems: Types of transportation problems, mathematical models, 9 transportation algorithms. Assignment: Allocation and assignment problems and models, processing of job through machines.

UNIT-III
Network Techniques: Shortest Path model, minimum spanning tree problem, Max-Flow 9 problem and Min-Cost problem. Project Management: Phases of Project management, guidelines for network construction, CPM and PERT.

UNIT-IV
Theory of Games: Rectangular games, Minimax theorem, graphical solution of $2 \times n$ *or* $m \times$ 9
2 games, game with mixed strategies, reduction to linear programming model. Elements of Queing model, generalized Poisson queing model.

Books & References

1. Wayne L. Winston; Operation Research, Thomson Learning, 2003.
2. R Panneer Seevam; Operation Research, PHI Learning, 2008.
3. V. K. Khanna; Total Quality Management, New Age International, 2008.
4. Hamdy H. Teha; Operation Research-An Introduction, Pearson Education, 2003.

MCA-126 JAVA PROGRAMMING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Analyze and explain the behavior of programs involving the fundamental program constructs
2. Identify and correct syntax and logic errors in short programs
3. Design and implement a class based on attributes and behaviors of objects
4. Describe the parameter passing mechanisms in terms of formal parameters, actual parameters, non-object parameters and object parameters

Topics Covered

Unit I **9**

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. - Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method
Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes

Unit II **9**

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

Unit III **9**

Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

Unit IV **9**

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers.
JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database.

EXPERIMENTS:
1. Basic programs of simple statements, conditional statements, iterative statements and arrays
2. Programs having object oriented concepts like Inheritance and Interface
3. Programs for Exception Handling and Event Handling
4. Programs of Threads and Multithreading
5. Programs related to Applets and Swings
6. Programs including JAVA Beans and Servlets

Books & References:
1. Naughton, Schildt, The Complete Reference JAVA2, TMH.
2. Balaguruswamy E, Programming in JAVA, TMH
3. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press
4. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
5. Margaret Levine Young, The Complete Reference Internet, TMH.

MCA-127 LINUX ADMINISTRATION & SHELL PROGRAMMING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course
1. Use the LINUX based system through various commands
2. Understand the task of LINUX system administration
3. Use of file and process related system calls using C language for system programming like IPC, semaphore etc.
4. Understand the shell programming constructs and their usage in shell scripting.

Topics Covered

UNIT-I **9**

History of Unix and Linux, Architecture of Linux, Advantages of Linux Introduction to Kernel, Introduction to Linux Shell: Types of Shell, Feature and benefits of Shell, general Linux utilities/commands, shell meta characters, I/O redirection and Piping, pipes, filters, Vi text editor, operation modes and related commands/options

UNIT-II **9**

Introduction to Linux Files: Rules for creating files, Linux Files system, File: Concept, types, permissions, File related commands & system calls, Usage of file related system calls through C programming. Process: concept, types, related commands & system calls, usage of process related system calls through C programming

UNIT-III **9**

Shell Script: Concept, Environment & Local Variables, Making script interactive through read and positional parameters, Relational, Arithmetic, Logical operators and their usage, Computation, Various programming constructs like while, for, if, case, until etc., Shell Script writing for different type of problems,

UNIT-IV **9**

root account, Creating user accounts in Linux, Changing password, Deleting User, Disabling user account, Linux Group, Password & Shadow File Formats, File System Creation, mounting/un-mounting of File System, Shutdown and Restart, Backup using tar and cpio, Custom Configuration and Administration Issues, Administration related commands with syntax and usage

EXPERIMENTS:

1. Practice of commands related to regular files and directories.
2. Practice of commands related to setting of file and directory permissions.
3. Writing of minimum five shell scripts based on numeric/string inputs for problems like Armstrong numbers, prime numbers, mathematical series and other related concepts.
4. Writing of minimum three C programs based on system call programming.
5. Writing of minimum two shell scripts for problems based on functions/files concept.

Books & References:

1. Sumitabha Das, "Unix Concepts & Applications (includes SCO Unix & Linux", Tata McGraw Hill Education
2. Kurt Wall, Mark Watson, Mark Whitis, Linux Programming, Third Edition, SAMS Techmedia.
3. Mark Sobell, Practical Guide to Linux Programming, Pearson Education.
4. Meeta Gandhi, Shetty & Shah, "Unix-The Open-Boundless", BPB Publications.
5. Graham Glass and King Ables, "Unix for Programmers & Users", Pearson Education
6. Ellen Siever, Robert Love and Arnold Robbins, Linux in Nutshell, Fifth Edition, Oreilly Media.

MCA-128 SOFT COMPUTING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Basics of ANN and its learning algorithms.
2. Fuzzy principles and relations.
3. Genetic algorithms and its applications.
4. Hybrid systems and usage of MATLAB toolbox

Topics Covered

Unit I **9**

Introduction to soft computing, Applications of Artificial Neural Networks, fuzzy logic, genetic algorithms and other soft-computing techniques, their strengths and weaknesses, artificial neural networks: over view of history, Mathematical Models of Neurons, ANN architecture.

Unit II **9**

Introduction to artificial neural network : Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonenself organizing networks, Hebbian learning; Hopfield Networks,

Unit III **9**

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Fuzzy Equations.

Unit IV **9**

Genetic algorithms(Gas), Evolution strategies(Ess), Evolutionary programming(EP), Genetic Programming(GP),Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models.

Books & References:

1. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press.
2. Siman Haykin, Neural Netw0rks, Prentice Hall of India
3. S. Rajshekharan& G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
4. Neuro-Fuzzy and Soft computing", Jang, Sun, Mizutani, Pearson
5. Neural networks: a comprehensive foundation", Haykin,
6. Genetic Algorithms", Goldberg,
7. Fuzzy Sets & Fuzzy Logic", G.J. Klir& B. Yuan, PHI.
8. Soft Computing, Sivanandan, PHI
9. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999
10. Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison- Wesley, California,
11. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.

MCA-129 ALGORITHMS DESIGN AND ANALYSIS

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Analyze randomized algorithms. Compare between different data structures. Pick an appropriate data structure for a design situation.
7. Explain what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms.
8. Understand concept of sorting networks

Topics Covered

Unit I **9**

Introduction: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time- Counting sort, Radix Sort, Bucket Sort, Medians and order statistics. Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

Unit II **9**

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms. Dynamic programming with examples such as, Multistage Graphs, Knapsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

Unit III **9**

Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets, Amortized Analysis.Advanced Data Structure: Red Black Trees, Augmenting Data Structure, B-Tree, Binomial Heap, Fibonacci Heap, and Data Structure for Disjoint Sets, priority Queues, mergeable heaps, concatenable queues

Unit IV **9**

Selected Topics: String Matching, Text processing- Justification of text, Sorting Network, Theory of NP-completeness, Approximation algorithms and Randomized algorithms, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms

Books & References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Computer Science Press, Maryland, 1978
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
6. Knuth, D.E , Fundamentals of Algorithms: The Art of Computer Programming Vol,1985

MCA-136 INTRODUCTION TO WIRELESS & MOBILE COMPUTING

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Demonstrate the energy management in wireless mobile networks.
2. Outline knowledge on Mobile IP.
3. Be familiar with the network protocol stack
4. Learn the basics of mobile telecommunication system
5. Be exposed to Ad-Hoc networks
6. Gain knowledge about different mobile platforms and application development

Topics Covered

Unit-1: **9**

Introduction to Electromagnetic Spectrum, modulation techniques, Mobile telephone systems, Cellular systems development and GSM/CDMA Standards, HSCSD and GPRS.

Unit II: **9**

Satellite Systems-GEO, LEO, MEO, Broadcast Systems-Broadcast transmission, Digital Audio Broadcasting-Multimedia Object Transfer Protocol. Digital Video Broadcasting. Infrastructure and ad hoc networks, 802.11- Bluetooth- Architecture, Applications and Protocol, Layers, Frame structure, comparison between 802.11 and 802.16. Wireless ATM- Services, Reference Model, Functions, Radio Access Layer. Handover- Reference Model, Requirements, Types, handover scenarios. Location Management, Addressing, Access Point Control Protocol (APCP).

Unit III: **9**

Mobile Network and Transport Layers: Mobile IP- Goals, Requirements, IP packet delivery, Advertisement and discovery. Registration, Tunneling and Encapsulation, Optimization, Reverse Tunneling, IPv6, Dynamic Host configuring protocol, Ad hoc networks – Routing, DSDV, Dynamic source routing. Hierarchical Algorithms. Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission.

Unit IV: **9**

Wireless Application Protocol & World Wide Web: WAP- Architecture, Protocols-Datagram, Transaction, Session -Wireless Application Environment-WML- Features, Script- Wireless Telephony Application. WWW- HTTP, Usage of HTML, WWW system architecture.

Books & References:

1. Jochen Schiller, Mobile Communications, Pearson Education Asia.
2. Andrew S. Tanenbaum, Computer Networks, PHI.
3. Leon-Garcia & Indra Widjaja, Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw Hill.

MCA-137 .NET FRAMEWORK AND C#

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The ability to effectively use visual studio .NET.
2. An understanding of the goals and objectives of the .NET Framework. .NET is a revolutionary concept on how software should be developed and deployed.
3. A working knowledge of the C# programming language.
4. An understanding of how to use forms to develop GUI programs under .NET.
5. Knowledge of some of the tools available in the .NET Framework class library.
6. Improved object-oriented programming skill through practice and insights gained by studying a new programming language.

Topics Covered

Unit-I **9**

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes.

Unit-II **9**

C -Sharp Language (C#) (cont.): Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading

Unit-III **9**

Managing Console I/O Operations, Windows Forms, Error Handling.
Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#,

Unit-IV **9**
Unsafe Mode, Graphical Device interface with C#, .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

Books & References:
1. Wiley, "Beginning Visual C# 2008",Wrox
2. Fergal Grimes, "Microsoft .Net for Programmers". (SPI)
3. Balagurusamy, "Programming with C#", (TMH)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, "C# with .Net Frame Work", Firewall Media

MCA-138 ARTIFICIAL INTELLIGENCE PRINCIPLES & TECHNIQUES

Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To learn the basics of designing intelligent agents that can solve general purpose problems
2. To learn the basics of designing intelligent agents that can represent and process knowledge
3. To learn the basics of designing intelligent agents that can plan and act
4. To learn the basics of designing intelligent agents that can reason under uncertainty
5. To learn the basics of designing intelligent agents that can learn from experiences

Topics Covered

Unit I **9**
Introduction The Foundations of Artificial Intelligence The History of Artificial Intelligence Intelligent Agents Agents and Environments Good Behavior The Nature of Environments The Structure of Agents Solving Problems by Searching Problem-Solving Agents Searching for Solutions Infrastructure for search algorithms Measuring problem-solving performance . Uninformed Search Strategies Informed (Heuristic) Search rategies Greedy best-first search .A* search Heuristic Functions Local Search Algorithms and Optimization Problem Local Search in Continuous Spaces Searching with Nondeterministic Actions Searching with Partial Observations Online Search Agents and Unknown Environments

Unit II **9**
Adversarial Search Games Optimal Decisions in Games Alpha--Beta Pruning Imperfect Real-Time Decisions Stochastic Games Partially Observable Games State-of-the-Art Game Programs Alternative Approaches Defining Constraint Satisfaction Problems Constraint Propagation: Inference in CSPs. Backtracking Search for CSPs Variable and value ordering Interleaving search and inference Intelligent backtracking: Looking backward Local Search for CSPs The Structure of Problems Knowledge, reasoning, and planning Logical Agents Propositional vs. First-Order Inference Backward Chaining ... Forward Chaining ... Unification and Lifting

Unit III **9**
Planning and Acting in the Real Worl Definition of Classical Planning Algorithms for Planning as State-Space Search Planning Graphs Classical planning as Boolean satisfiability . Representing temporal and resource constraints. Planning and Acting in Nondeterministic Domains. Knowledge Representation Acting under Uncertainty Probabilistic Reasoning Time and Uncertainty

Unit IV **9**
Forms of Learning Supervised Learning, Decision Trees Evaluating and Choosing the Best Hypothesis A Logical Formulation of Learning Statistical Learning with Complete Data Natural Language Processing

Books & References:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2012.
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2012.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2012
4. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998

PE1 & PE2

MCA-152 DATA WAREHOUSING & DATA MINING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Approach business problems data-analytically by identifying opportunities toderive business value from data.
2. know the basics of data mining techniques and how they can be applied to extractrelevant business intelligence

Topics Covered

Unit I **9**

Introduction to Data Mining: Motivation for Data Mining, Data Mining-Definition &Functionalities, Classification of DM systems, DM task primitives, Integration of a DataMining system with a Database or a Data Warehouse, Major issues in Data Mining. Data Warehousing .Overview of concepts like star schema, fact and dimension tables, OLAP operations, From OLAP to Data Mining. Data Pre processing: Why? Descriptive Data Summarization, Data Cleaning: Missing Values, Noisy Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Data Discretization and Concept hierarchy generation for numerical and categorical data.

Unit II **9**

Mining Frequent Patterns, Associations, and Correlations: Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Item set Mining Methods, The Apriori Algorithm for finding Frequent Item sets Using Candidate Generation, Generating Association Rules from FrequentItem sets, Improving the Efficiency of Apriori, Frequent Itemsets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based Prediction: Linear and non linear regression Accuracy and Error measures, Evaluating the accuracy of a Classifier or Predictor.

Unit III **9**

Cluster Analysis: Types of Data in cluster analysis, Categories of clustering methods, Partitioning methods K-Means, K-Mediods Hierarchical Clustering-Agglomerative and Divisive Clustering, BIRCH and ROCK methods, DBSCAN, Outlier Analysis stream data Classification, Clustering Association Mining in stream data. Mining Sequence Patterns in Transactional Databases

Unit IV **9**

Spatial Data and Text Mining: Spatial Data Cube Construction and Spatial OLAP, Mining Spatial Association and Co-location Patterns, Spatial Clustering Methods, spatial Classification and Spatial Trend Analysis. Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches Web mining introduction, Web Content Mining, Web Structure Mining, Web Usage mining, Automatic Classification of web Documents. Data mining for business Applications like

Balanced Scorecard, Fraud Detection, Click stream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc.

Books & References:

3. MacLennan Jamie, Tang ZhaoHui and Crivat Bogdan, .Data Mining with Microsoft SQLServer 2008., Wiley India Edition.
4. G. Shmueli, N.R. Patel, P.C. Bruce, .Data Mining for Business Intelligence: Concepts,Techniques, and Applications in Microsoft Office Excel with XLMiner., Wiley India.
5. Michael Berry and Gordon Linoff .Data Mining Techniques., 2nd Edition Wiley Publications.
6. Alex Berson and Smith, .Data Mining and Data Warehousing and OLAP., McGraw HillPublication.
7. E. G. Mallach, .Decision Support and Data Warehouse Systems", Tata McGraw Hill.
8. Michael Berry and Gordon Linoff .Mastering Data Mining- Art & science of CRM., WileyStudent Edition
9. Arijay Chaudhry & P. S. Deshpande, .Multidimensional Data Analysis and Data MiningDreamtech Press
10. VikramPudi&Radha Krishna, .Data Mining, Oxford Higher Education.
11. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 2nd Edition
12. P. N. Tan, M. Steinbach, Vipin Kumar, .Introduction to Data Mining., Pearson Education

MCA-153 ADVANCE TOPICS IN SOFTWARE ENGINEERING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. understanding of Software Engineering concepts.
2. knowledge of the Analysis and System Design concepts.
3. Knowledge of managing changes during development.
4. Learning the SOA and AOP concepts.

Topics Covered

Unit I **9**

System Concepts: Software Engineering Concepts, Software Life Cycle Development Activities, Managing Software Development Unified Modeling Language Project Organization Communication

Analysis: Requirements Elicitation, Use Cases, Unified Modeling Language, Object Model ,Dynamic Models, Nonfunctional requirements Analysis, Patterns.

Unit II **9**

Overview of System Design , Decomposing the system , System Design Concepts System Design Activities Addressing Design Goals Managing System Design

UNIT III **9**

Programming languages and coding , Human computer interaction, Reusing Pattern Solutions Specifying Interfaces,Mapping Models to Code,Testing Rationale Management, Configuration Management , Project Management , real time interface design

UNIT IV **9**

Aspect Oriented Software Development, AO Design Principles Separations of Concerns, Subject Oriented Decomposition,Traits , AspectOriented Decomposition, Theme Approach, Designing Base and Crosscutting Themes, Aspect Oriented Programming using AspectJ

Books & References:

1. Bernd Bruegge, Alan H Dutoit, Object Oriented Software Engineering, 2nd ed, Pearson Education, 2004.
2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
3. Stephen Schach, Software Engineering 7th ed, McGraw Hill, 2007.

4. AspectJ in Action, RamnivasLaddad, Manning Publications, 2003
5. Aspect Oriented Software Development, Robert E. Filman, TzillaElrad, Siobhan Clarke, and Mehmet Aksit, October 2006.

MCA-154 DIGITAL IMAGE PROCESSING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand Digital Image Processing fundamentals
2. To learn Image Transformation, Enhancement, Restoration and Compression Techniques.
3. To implement various techniques for Segmentation of Images
4. To learn the Image Reconstruction operations.
5. To implement Image Processing Techniques for suitable applications

Topics Covered

Unit I **9**

Light, Brightness adaptation and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

UNIT II **9**

Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Unit III **9**

Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, Lossless predictive coding, Lossy predictive coding, Motion Compensation Expansion of functions, Multi resolution analysis, Scaling functions, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, Digital Image Watermarking.

Unit IV **9**

Basics of Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion. Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Books & References:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Second Edition, 2012.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson 2012.
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2011.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2010.
5. William K. Pratt, Digital Image Processing, John Wiley, New York, 2012.
6. D, E. Dudgeon and R M. Mersereau, Digital Signal Processing, Prentice Hall Professional Technical Reference, 2010.
7. Milan Sonka et al, Image Processing, Analysis and Machine Vision, Brookes/Cole,

MCA-155 REAL TIME SYSTEM

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To analyze the feasibility of a set of independent tasks;
2. To differentiate between various timing analysis techniques
3. To recite required real-time services for operating systems
4. To reiterate the characteristics of soft real-time systems
5. To characterize the impact of power consumption on embedded resources

Topics Covered

Unit I **9**

Real-time Applications and Computation Model: Example of real-time applications, Hard and Soft timing constraints, Task and computational model, Performance metrics, Prediction of Execution Time: Source code analysis, Micro-architecture level analysis, Cache and pipeline issues

Unit II **9**

Task assignment and Scheduling: Task allocation algorithms, Single-processor and multiprocessor task scheduling, Clock-driven and priority-based scheduling algorithms, Programming Languages and Tools: Characteristics of real-time languages, commonly used languages, Run-time support, Complier optimization

Unit III **9**

Real-time Databases (time permitting): Transaction priority and concurrency control issues, Disk scheduling ,Real-Time Communication: Real-time networks, Communication protocols

Unit IV **9**

Fault-Tolerance Techniques: Faults types and detection techniques, Redundancy management, Integration issues

Books & References:

1. C. Mani Krishna, Real-Time Systems, University of Massachusetts, Amherst Kang Shin, University of Michigan, Ann Arbor, McGraw-Hills, ISBN 0-07-057043-4
2. Jane W. S. Liu, Real-Time Systems, 1/e, University of Illinois at Urbana-Champaign, Prentice Hall, ISBN 0-13-099651-3
3. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
4. Stuart Bennett, Real Time Computer Control- An Introduction", Second edition Prentice Hall PTR, 1994.
5. Peter D. Lawrence, Real time Micro Computer System Design – An Introduction, McGraw Hill, 1988
6. S.T. Allworth and R.N. Zobel, Introduction to real time software design", Macmillan, II Edition, 1987.
7. R.J.A Buhur, D.L. Bailey, An Introduction to Real-time Systems", Prentice Hall International, 1999.
8. Philip. A. Laplante Real Time System Design and Analysis" PHI, III Edition, April2004.
9. C.M. Krishna, Kang G. Shin, Real-Time Systems", McGraw-Hill International Editions, 1997.

MCA-156 FAULT TOLERANT SYSTEMS

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand faults and its types
2. To create fault tolerant systems

Topics Covered

Unit I **9**

Dependability concepts: dependable system, techniques for achieving dependability, dependability measures, fault, error, failure, faults and their manifestation, classification of faults and failures.
Fault tolerant strategies: Fault detection, masking, containment, location, reconfiguration, and recovery.

Unit II **9**

Fault tolerant design techniques: Hardware redundancy, software redundancy, time redundancy, and information redundancy. Testing and Design for Test ability. Self-checking and fail-safe circuits.
Information Redundancy: coding techniques, error detection and correction codes, burst error detection and correction, unidirectional codes.

Unit III **9**

Fault tolerance in distributed systems: Byzantine General problem, consensus protocols, check-pointing and recovery, stable storage and RAID architectures, and data replication and resiliency. Dependability evaluation techniques and tools: Fault trees, Markov chains; HIMAP tool. Analysis of fault tolerant hardware and software architectures. System-level fault tolerance and low overhead high-availability technique.

Unit IV **9**

Fault tolerance in real-time systems: Time-space tradeoff, fault tolerant scheduling algorithms.Fault tolerant interconnection networks: hypercube, star graphs, and fault tolerant ATM switches. Dependable communication: Dependable channels, survivable networks, fault-tolerant routing. Case studies of fault tolerant multiprocessor and distributed systems. Reading of some of the state-of-the-art research material.

Books & References:

1. Fault Tolerant Computer System design by D. K. Pradhan, Prentice Hall.
2. Reliable Computer Systems: Design and Evaluation (second edition) by D. P. Siewiorek and R. S. Swarz, Digital Press.
3. Design and Analysis of Fault Tolerant Digital Systems by B.W. Johnson, Addison Wesley, 1989.
4. Fault Tolerance in Distributed Systems, Pankaj Jalote, PTR Printice Hall, 1994.

MCA-157 INTRODUCTORY COURSE ON COMPILER DESIGN

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Define the phases of a typical compiler, including the front--- and back--- end.
2. Identify tokens of a typical high---level programming language; define regular expressions for tokens and design; implement a lexical analyzer using a typical scanner generator.
3. Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation; design and implement a parser using a typical parser generator.
4. Apply an algorithm for a top---down or a bottom---up parser construction; construct a parser for a small context---free grammar.
5. Explain the role of a semantic analyzer and type checking; create a syntax---directed definition and an annotated parse tree; describe the purpose of a syntax tree.
6. Explain the role of different types of runtime environments and memory organization for implementation of typical programming languages.

7. Describe the purpose of translating to intermediate code in the compilation process.

Topics Covered

Unit I **9**

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool-based approach to compiler construction.
Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, and implementation. Regular definition, Transition diagrams, LEX.

Unit II **9**

Syntax analysis: context free grammars, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, Bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

Unit III **9**

Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.
Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.
Intermediate code generation: intermediate representations, translation of declarations, assignments Intermediate Code generation for control flow, Boolean expressions and procedure calls, implementation issues.

Unit IV **9**

Symbol table management, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing.
Code optimization, peephole optimization, source of optimizations, optimization of basic blocks, loops, global dataflow analysis.

Books & References:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, Compilers: Principles, Techniques, and Tools, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, Engineering a Compiler, Elsevier, 2004.
3. AW Appel, J Palsberg, Modern Compiler Implementation in Java, Cambridge University Press, 2002
4. AW Appel, M Ginsburg, Modern Compiler Implementation in C, Cambridge University Press.

MCA-158 DISTRIBUTED DATABASE SYSTEM

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. explain the key concepts and techniques for database tuning and implementation, such as data storage, indexing, query evaluation, query optimization, transaction management, concurrency control and cash recovery.
2. analyze and tune database systems for performance enhancement by applying the above concepts and techniques.
3. analyze and design distributed database systems based on the principles of distributed indexing, distributed query evaluation, data replication, distributed transaction and distributed concurrency and recovery

Topics Covered

Unit I **9**

Introduction: Distributed data processing; What is a DDBS?; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts; Distributed Database Management System Architecture: Transparencies in a

distributed DBMS; Distributed DBMS architecture; Global directory issues; Distributed Database Design: Alternative design strategies; Distributed design issues; Fragmentation; Data allocation

Unit II **9**

Semantics Data Control: View management; Data security; Semantic Integrity Control ;Query Processing Issues: Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data; Distributed Query Optimization: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms

Unit III **9**

Transaction Management: The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models; Concurrency Control: Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management

Unit IV **9**

Reliability: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols; Parallel Database Systems: Parallel architectures; parallel query processing and optimization; load balancing; Advanced Topics: Mobile Databases, Distributed Object Management, Multi-databases

Books & References:

1. M. Tamer Oezsu, Patrick Valduriez ``Principles of Distributed Database Systems, Second Edition" Prentice Hall, 1999
2. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.
3. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg. AW
4. Distributed Database Principles and Systems. Ceri and Pelagatti. McGraw Hill.
5. Recovery Mechanisms in Database Systems. Kumar and Hsu, Prentice Hall.
6. Concurrency Control and Recovery in Database Systems. Bernstein, Hadzilacos and Goodman, AW
7. Other materials required for the class will be made available during the course.

PE3 & PE4

MCA-159 DISTRIBUTED COMPUTING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To critically appraise advanced technologies for developing distributed systems.
2. To practically examine the development of Microkernel, Distributed algorithms, Time stamping in distributed systems
3. To critically investigate the problems and pitfalls of distributed systems
4. To understand the assumptions and limitations of the underlying distributed systems

Topics Covered

Unit I **9**

Distributed Systems - Goal - Advantages over centralized systems - Organization of multiprocessor systems - Hardware/software concepts - Review of layered protocols. Client/Server Model - Microkernel - RMI - Distributed algorithms - Time stamping - Circulating tokens - Diffusing computations.

Unit II **9**

Mutual Exclusion Algorithm - Election algorithm - Detecting loss of tokens and regeneration - Distributed deadlock detection algorithms - Distributed termination algorithms.

Unit III **9**

File Replication - Semantics of file sharing - Remote access methods - Fault tolerant issues - Introduction to distributed operating systems.

Unit IV **9**

Introduction to Distributed Operating Systems - Motivations - Management systems - Levels of distribution transparency - Architecture - Introduction to concurrency control.

Books & References:

1. George Coulouris and Jean Dollimore, and Tim Kindberg, "Distributed System Concepts and Design", 4th Edition, Addison Wesley, 2005
2. A. S. Tanenbaum, "Distributed Operating Systems", Prentice Hall, 1995.
3. S. Ceri and G.Pelagatti, "Distributed Databases - Principles and Systems", McGraw Hill, 1985

MCA-160 SOFTWARE ARCHITECTURE AND PROJECT MANAGEMENT

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To have a clear understanding of Software Architecture concepts.
2. To gain insight of the Project Management related issue.
3. To understand and Appreciate software architecture related issues.
4. To successfully handle a moderate size real life software project.

Topics Covered

Unit I **9**

Introduction to Software Architecture, Architecture Business Cycle, What is software architecture, software architecture requirements, Architecture structures and views, Documenting software architectures, Opportunities and Advances in software architectures.

Need of quality attributes, Understanding quality attributes, architecture and quality attributes, achieving quality attributes. Case study of quality attributes in software architecture templates. Deriving Quality Attributes for software architectures

Unit II **9**

Design Patterns: history, principles and expectations. Study of a number of representative patterns like Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite, chain of. Ways of using patterns Case studies of patterns in software architecture.

Introduction to Middleware, Types of Middleware, Application servers, Introduction to Java EE, Introduction to Java EE technologies like JMS, JDBC, RPC, RMI, SOCKET. EJB 3.0 Architecture, Entity, Session, Message beans, XML, XSLT. Specifications and characteristics of Middleware technologies. Recent advances in Middleware technologies

Unit III **9**

Project Management: The management spectrum, the people, the product, the process, the project, the WHH principle, critical practices. Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process,metrics for small organizations, establishing a software metrics program.

Quality Planning: Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning.

Unit IV **9**

Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management.
Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality,Risk-Related Monitoring.

Books & References:

1) Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice",Pearson
2) Erich Gamma,"Design Patterns".
3) R. S. Pressman, "Software Engineering".
4) Pankaj Jalote, Software project management in practice, Addison-Wesley
5) B. Hughes & M. Cotterell, "Software Project Management", TMH

MCA-161 PROGRAMMING IN PYTHON

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Write basic and advance Python programs
2. Write conditional and iterative statements in Python
3. Create arrays and use array methods in Python
4. Use various standard Python modules
5. Create functions and implement recursion in Python
6. Create and use Python classes and objects
7. Write code for Constructors, Destructors, Inheritance, Polymorphism and Exception handling
8. Write code for file handling and various file operations
9. Solve various real time problems using Python
10. Solve problems of Data Science and Machine Learning with Python

Topics Covered

UNIT I: Programming Basics and Decision Making **9**

Introduction: Key features and applications of Python, Python Editors and Compilers (Interpreters), Using different offline and online Python IDE, Interacting with Python programs, **Data types:** Numeric, Boolean, Strings, Lists, Sets, Tuples, Dictionary; **Variables:** Declaration and initialization; **Simple Statements**: Taking inputs from user, Displaying outputs, **Other concepts:** Operators, Expressions, Indentation, Comments, Casting; **Conditional statements:** If…Else

UNIT II: Control Flow and Other Programming Concepts **9**

Iterative statements: For Loops, While Loops, Break, Continue; **Array:** Looping Array elements, Array methods; **Functions:** Local and Global Variables, Built-in functions, User defined functions, Declaration of a function, Defining the function, Calling of the function, Functions with arguments, Recursion

UNIT III: OOP and File Handling **9**

Object Oriented Programming: Classes and objects, attributes and methods, constructors and destructors, inheritance, polymorphism, **Exception Handling:** Try…Except; **Management of text files:** Type of files, various file operations on text files, creating a text file, opening a file, closing a file, reading a text file, writing into a text file, copying a file to another file

UNIT IV: Advance Concepts **9**

Problem solving: Use of Python to solve real time problems, How Python helps to research problems, Creating various types of graphs corresponding to any data to show different kinds of results and analysis; **Data Analysis:** Understanding problems of data science and machine learning, Creating codes for data analysis problems in Python, Other advance programs

Books & References:

1. Alex Martelli, "Python in a Nutshell"
2. Allen Downey, "Think Python"
3. Ken Lambert, "Fundamentals of Python: First Programs"
4. Willi Richert, Luis Pedro Coelho, "Building Machine Learning Systems with Python"
5. Cody Jackson ,"Learning to Program Using Python"
6. Ljubomir Perkovic, "Introduction to Computing Using Python"
7. https://www.w3schools.com/python/default.asp
8. https://www.w3resource.com/python/python-tutorial.php
9. https://www.geeksforgeeks.org/python-tutorial/
10. https://www.geeksforgeeks.org/python-programming-language/

EXPERIMENTS:

1. Writing codes using simple statements, operators and expressions
2. Writing codes using conditional
3. Writing codes using iterative statements
4. Writing programs for creating arrays, looping array elements and using array methods
5. Writing programs to use various standard modules
6. Writing codes to create functions and implement recursion
7. Writing object oriented codes for Constructors, Destructors, Inheritance, Polymorphism and Exception handling
8. Write codes for various file operations
9. Developing codes for solving various real time problems
10. Developing codes for solving problems of Data Science and Machine Learning
11. Writing codes to create various types of graphs corresponding to any data
12. Writing other advance programs in Python

MCA-162 CLOUD COMPUTING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand basics of cloud, fog and edge computing
2. To understand various issues and challenges in cloud computing

Topics Covered

Unit-I **9**

Introduction: Basics of the emerging cloud computing paradigm, cloud computing history and evolution, cloud enabling technologies, practical applications of cloud computing for various industries, the economics and benefits of cloud computing **Cloud Computing Architecture:** Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Resource management and scheduling, QoS (Quality of Service) and Resource Allocation, Clustering

Unit-II **9**

A Classification of Cloud Implementations- Amazon Web Services - IaaS, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), VMware vCloud - IaaS, vCloud Express, Google AppEngine - PaaS, The Java Runtime Environment

Unit-III **9**

Cloud Computing delivery Models: Cloud based services: Iaas , PaaS and SaaS Infrastructure as a Service (IaaS):Introduction to IaaS, Resource Virtualization i.e. Server, Storage and Network virtualization Platform as a Service (PaaS):Introduction to PaaS, Cloud platform & Management of Computation and Storage, Azure, Hadoop, and Google App. Software as a Service (SaaS):Introduction to SaaS, Cloud Services, Web services, Web 2.0, Web OS Case studies related

to IaaS, PaaS and SaaS

Unit-IV **9**

The Python Runtime Environment- The Datastore, Development Workflow, Windows Azure Platform - PaaS, Windows Azure, SQL Azure, Windows AzureAppFabric, Salesforce.com - SaaS / PaaS, Force.com, Force Database - the persistency layer, Data Security, Microsoft Office Live - SaaS, LiveMesh.com, Google Apps - SaaS, A Comparison of Cloud Computing Platforms, Common Building Blocks.

Books & References:

1.The Complete Cornerstone Guide to Cloud Computing Best Practices, Second Edition, Gerard Blokdijk, Ivanka Menken by Emereo Pty Ltd, 2009
2.Cloud Computing: A practical Approach Anthony Velte, Toby Velte and Robert Elsenpeter by Tata McGrawHill
3.Cloud Computing Principles and Paradigms, Rajkumar Buyya, James Broberg and Goscinski by John Wiley and Sons
4.Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Cloud Computing: Principles and Paradigms, 2011
5.Michael Miller, Cloud Computing, 2008
6.Judith Hurwitz, Robin Bllor, Marcia Kaufmann, Fern Halper, Cloud cOmputing for Dummies, 2009

MCA-163 ADVANCED CONCEPTS IN DATABASE SYSTEMS

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand advance concepts of database
2. To understand OLAP, P2P etc.

Topics Covered

Unit I **9**

Database modeling (relational, object-oriented models, web models). Object-oriented/object-relational databases. Active database systems (i.e., databases and rule management). Distributed databases

Unit II **9**

On-line Analytic Processing (OLAP). Query optimization. New data types: unstructured, textual, etc. Databases and the WWW. XML databases

Unit III **9**

Multimedia database systems. Temporal and spatial databases. Stream management systems, Continuous query processing , Schema evolution managers Middle layer engines. Sensor database systems.

Unit IV **9**

P2P technology. Heterogeneous databases and data integration. Mobile/Disconnected databases. Data management problems and solutions for non-traditional applications, such as E-commerce, engineering, internet, intranet, etc.

Books & References:

1. Raghu Ramakrishnan and Johannes Gehrke, DATABASE MANAGEMENT SYSTEMS McGraw-Hill Publisher, third Edition Pub date: 2002,
2. Fundamentals of Database Systems, R. Elmasri, and S. Navathe, Benjamin Cummings.
3. Principles of Data and Knowledge Base Systems, Volume 1, J.D. Ullman, Computer Science Press.
4. Database System Concepts, 2nd Edition, H.F. Korth and A. Silberschatz, McGraw-Hill.
5. A First Course in Database Systems, J. Widom and J. D. Ullman, Prentice-Hall.

MCA-164 ADVANCED COMPUTER NETWORKS

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To study about interconnection of networks
2. To debate the current trends and leading research in the computer networking area.
3. To understand the recent advancement in networking.
4. To study the IP protocol and it's routing
5. To introduce the TCP protocol.
6. To study the Internet applications and security

Topics Covered

UNIT I **9**

Introduction: Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, Review of Physical and Data link layers, MAC protocols for high-speed LANS, MANs, DQDB, FDDI, HIPPI, Gigabit Ethernet, Wireless Ethernet.

UNIT II **9**

Network Layer: Internet Architecture and addressing, Routing Protocols- OSPF, RIP, BGP, IPv6- basic protocol, extensions and options, support of QoS, security, etc. Mobility in networks, Mobile IP, Multicast routing protocols

UNIT III **9**

Transport Layer: Design Issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), TCP extensions for high-speed networks, SCTP protocol, Wireless TCP, RTP, RTCP and Introduction to Socket programming.

UNIT IV **9**

Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System, P2P File Sharing.

Books & References:

1. Data Communications and Networking - Behrouz A. Forouzan, (Tata McGraw Hill), 4th edition 2007.
2. Data Communications - W. Stallings, , PHI Publication.
3. TCP/IP Illustrated, Volume 1: The Protocols - W.R. Stevens (Addison Wesely), 1994
4. An Engineering Approach to Computer Networking - S. Keshav (Pearson Education)
5. Computer and Communication Networks - Nader F. Mir (Pearson Education), 2007.
6. Computer Networking: A Top-Down Approach Featuring the Internet - James F. Kurose, Keith W. Ross, (Pearson Education), 3rd edition, 2007.
7. The Internet and Its Protocols - A. Farre (Elsevier)

MCA-165 MODERN NETWORKING CONCEPTS

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand the latest technology in Networking, its transmission mechanisms and media access.
2. To study about the wired, wireless LANs and backbone networks.
3. Identify the type of networks and protocols for a given network scenario.
4. To Design a network aimed at optimum performance.

Topics Covered

Unit I **9**

Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, Review of Physical and Data link layers, MAC protocols for high-speed LANS, MANs, DQDB, FDDI, HIPPI, Gigabit, Ethernet, Wireless Ethernet, Mobile IP.

Unit II **9**

High,Speed Networks, Frame relays, Packet switching networks, Frame relay networks, ATM protocol architecture – Logical connections, ATM cells, Service categories, ATM adaptation layer, High speed LANs Wireless LANs.

Unit III **9**

Design Issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), TCP extensions for high-speed networks, SCTP protocol, Wireless TCP, RTP, RTCP and Introduction to Socket programming.

Unit IV **9**

Network architecture – Implementing network software – Performance , Reliable transmission –Ethernet and Multiple access network (802.3) – WiMax , Bluetooth/802.15.1 , Cell phone technologies

Books & References:

1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Morgan Kaufmann,2012.
2. William Stallings, High-Speed Networks and Internets: Performance and Quality of Service, Pearson Education, 2010.
3. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson Education,2013.
4. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson Education, 2011.
5. Behrouz Forouzan, Data communications and Networking, Tata Mc Graw Hill Education, 2009

MCA-166 PRINCIPLES OF USER INTERFACE DESIGN

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will describe the design process.
2. Students will apply evaluation tools to a design project
3. Students will apply designer tools, techniques, and ideas to interface design
4. Students will critically analyze literature of human-computer interaction

Topics Covered

Unit I **9**

Introduction: Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories,

Development Processes: Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

Unit II **9**

Evaluating Interface Design: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments

Interaction Styles: Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality**,** Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

Unit III **9**

Design Issues: 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, Non-anthropomorphic Design, Display design, web page design, Window Design, Color

Unit IV **9**

User Documentation and Online Help: Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process.

Information Search and Visualization: Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, Advanced filtering and Search Interfaces,

Information Visualization: Introduction, Data type by task taxonomy, Challenges for information visualization.

Books & References:

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010
2. Alan Dix, Janet Finalay, Gregory D AbiwdmRussel Bealel: Human-Computer Interaction, III Edition, Pearson ,Education, 2008.
3. Eberts: User Interface Design, Prentice Hall, 1994
4. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

MCA-167 TCP/IP PROGRAMMING

Course category	: Program Electives (PE)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, Minor test and Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand various system calls
2. To understand various network protocols
3. To be able for socket and TCP/IP Programming

Topics Covered

Unit-I: **9**

Overview of TCP/IP and Internet: Need of Protocol on Communication, Problems in Computer Communication, Dealing with Incompatibility, A Brief Histay of the Internet, architecture of the Internet, TCP/IP Layer and Protocols, Network Access Layer, Internet Layer: IP, ARP, RARP, ICMP, Transport Layer, Application Layer: Email, DNS, SNMP, TELNET, HTTP

Unit-II: **9**

Client Server Communication, Designing Client Server Programs, Socket Concepts, IP Address and Ports, Byte Ordering, Sketch of Networking Connection, Active and Passive Sockets, Socket Fundamentals

Unit III: **9**

Elementary Socket System Calls: Socket System Call, Bind System Call, Connect System Call, Listen System Call, Accept System Call, Elementary Data Transfer Calls , Closing a Socket ,TCP and UDP Architectures

Unit-IV: **9**

Advance System call, Data Transfer, Byte Operations and Addressing, Socket Options, Select System Call, Raw Socket, Multiple Recipients: Unicasting, Broadcasting, Multicasting, Quality of Service Issues

Books & References:

1. Achyut S Godbole, Web Technologies, TATA McGrawHill.
2. Berhouz A Forouzan, TCP/IP Protocol Suite, TATA McGraw Hill
3. Berhouz A Forouzan, Data Communications & Networking, TATA McGraw Hill
4. Douglas E. Comer, Internetworking with TCP/IP Vol.1:Principle, Protocols and Architecture
5. http://www.tcpipguide.com
6. http://www.cisco.com