MATS UNIVERSITY
MASTER OF COMPUTER APPLICATION (MCA) 2/3 year
REGULATIONS

Introduction to the course –

India has proved its natural expertise in software development and related expertise after emergency as largest BPO organizations to cater top IT industries worldwide. Now this natural quality of Indians to outperform in logic development has made them as a natural choice for HR recruitment in any big IT organization. This process is not only creating jobs for Indians worldwide but also enhancing the foreign reserve level of our nation.

With this situation in mind country needs excellent education facilities to generate a HR of high quality to cater IT needs worldwide.

Program Objective

- To prepare graduates who will be successful in industry, government, academia, research, entrepreneurial pursuit and consulting firm
- Student will develop software solutions to problems across a broad range of application domain.
- Graduates will be able to communicate technical information effectively, both orally and in writing
- Graduates will be able to work collaboratively as a member or leader in multidisciplinary teams.

Program Outcome

- Student will get ability to identify, critically analyse, formulate and develop computer application
- Student will be able to select modern computing tool and techniques and use them with dexterity
- Student will get skill to analyse a problem and identify and define the logical modelling of solution
- Students will be able to use the techniques, skills and modern hardware and software tools necessary for innovative software solutions.
- Student get ability to devise and conduct experiments, interpret data and provide well informed conclusions

1. Scope and Content:

1.1 The Regulation documented here are applicable for the Master of Computer Applications progamme offered by the University.

1.2 The applicability of the Regulation must be understood in the context of the given Scheme of study and Syllabus of the programme.

1.3 The authorities of University may modify, add, delete expand or substantiate any part of the Regulations and syllabi, at any time.

2. Course Content:

The programme, shall be for a duration of six semesters, spread out in three years. Each semester of the programme shall consist of either all or some of the following components:

2.1 Core Subjects
2.2 **AECC (**AbilityEnhancenment Compulsory Course)
2.3 **SEC**(Skill Enhancment Course)
2.4 **DSE** (Discipline Specific Electives) /Choice Based
2.5 **GE**(Generic Electives)
2.6 Lab Course
2.7 Project Work
2.8 **Specializations**

2.1 Core Subjects

Core subjects comprises of subjects that form an integral part of the programme. These subjects provide a strong ground in basic disciplines of study.

2.2 AECC (AbilityEnhancenment Compulsory Course)

The students who have not done English up to class XII are to opt for Hindi Communication. They can opt Environment studies and other languages also .

2.3 SEC(Skill Enhancment Course)

This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students.

2.4 DSE (Discipline Specific Electives) /Choice Based

Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study)

2.5 GE(Generic Electives)

An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

2.6 Lab Courses

These subjects are totally practical-based subjects. The learning of these subjects will be performed in laboratories/practical sites with equipments/resources. These subjects shall support the practical implementation of the core/core-bracket subjects. The processes of evaluation of their subjects will depend on the nature of that individual subject.

2.7 Project Work

The project work shall be done for a duration as specified by the Coordinator, in the area, related to the main subject of study or the specialization. The project work shall give the student an insight to the situations existing in the field/marked/industries, etc.

2.8 Specializations

MCA students may specialize in any one of the following specializations:

Elective – 1

1. Advanced DBMS
2. Wireless Communication

Elective – 2

1. Advance Data Warehousing and Mining
2. MANET and Wireless Sensor Network
3. Parallel and Distributed Computing
4. Soft Computing

Elective – 3

1. Geo-Informatics
2. Bio-Informatics
3. Nano -Technology, NEMS Technology & Applications
4. Image Processing
5. Neural Network
6. Embedded System
7. Advanced software Engineering

3 Eligibility for admission and mode of selection

3.1 The minimum qualification required to be eligible for admission is a pass in a Graduate Degree examination of this University or any other examination recognized as equivalent thereto of any other recognized University, with Mathematics as one of the subjects of study either at the 10+2 or at the Bachelors' degree level.

3.2 The method of selection for the course shall normally be by means of an entrance test and a personal interview.

4 Attendance Requirement

A student is eligible to appear for the term-end examinations, only if she/he has put in a minimum of 75% attendance in each subject individually.

5 Assessment and Examination

5.1 Credits

Credit Points will be awarded for all the subjects. One credit is equivalent to ten classroom contact hours.

Each core subjects will carry either 4 or 2 credits, each bracket subject will carry 3 credits and practical courses will carry either 4 or 2 credits depending on the number of hours of teaching and training.

5.2 Pattern of Assessment

Assessment of student's performance will be based on two components i.e. Internal Assessment and Term-end Examination conducted at the end of each semester.

A four-credit subject will comprise of an Internal Assessment component of 30 marks and a Term-end Examination components of 70 marks.

A two-credit subject will comprise of an Internal Assessment component of 15 marks and a Term-end Examination components of 35 marks.
Sessional tests, assignments, mid-term examinations etc, will be conducted in each subject during the course of each semester, for the purpose of internal assessment.
The Term-end examinations will be conducted as per the University regulations.

5.3 Assessment for Core Bracket subjects

Depending on the participation and performance of students, the faculty of the Core Bracket subject will grade the student in terms of a four-point scale as given below:

Marks Secured	Grade Point	Letter Grade
80 and above	10	Outstanding(O)
70 and above but below 80	9	Excellent (A+)
65 and above but below 70	8	Very Good (A)
60 and above but below 65	7	Good (B+)
55 and above but below 60	6	Above Average (B)
50 and above but below 55	5	Average (C)
45 and above but below 50	4	Pass(P)
Below 45	0	Fail (F)
	0	Absent (AB)

This assessment is purely based on internal assessment of the subject faculty/coordinator.

5.4 Assessment of Project work

The project work will carry a total of 600 marks. Of this, 70% marks are for the external examination and 30% marks will be awarded for internal evaluation.

Evaluation of Industrial Project and Seminar:

a. During the 6th Semester, the students shall present on the scheduled dates, their progress, twice to the Departmentcommittee based on which the Project sessional marks are awarded.
b. The project Seminar marks are awarded based on the project presentation and decomposition at the end of the semester by the Department committee.
c. Project final evaluation in the Term – end Exams, is based on project report and viva-voce.

5.5 Eligibility to appear for the Term-end Exam.

Students, who have put in minimum of 75% attendances in each subject, shall be eligible to appear for the Term-end examination.

6 Eligibility for Pass

6.1 A student shall be declared to have passed in a subject, if he/she secures at least 50% marks in the term-end examination, including internal assessment.

6.2 When a student reappears for the failed subject(s), the internal assessment marks originally secured by him/her in the first appearance in the subject(s), if any, will be caries forward.

6.3 A student shall be declared to have passed in a Core Bracket subject, if he/she secures at least a pass grade.

6.4 Promotion of the student to the next semester, is not automatic, but is dependent on certain other conditions.

7 Classification of successful students

7.1 On successful completion of the programme, the students will be classified as below:

Distinction :Those securing aggregate marks of 75% and above in all the subjects;

First Class :Those securing aggregate marks ofless than 75% but above 60% above in all the subjects; and

Second Class:Those securing aggregate marks ofless than 60% but above 50% above in all the subjects;

7.2 Ranks Only students, who have passed each of the semester examination at the first appearance, shall be eligible for award of Ranks. The First three ranks shall be notified.

8 Award of Qualification

Students will be awarded the MCA degree upon Fulfilment of the following criteria –

a. must have passed all the subjects of the six semesters with minimum of 45% in each subject including Internal assessment.
b. must have secured at least a pass grade in all the Core Bracket subjects.
c. must have secured a minimum of 45% marks in the project work (wherever applicable).
d. must have complied with all other assessment guidelines and criteria notified during the conduct of the programme.

9 Maximum period for completion of the programme

The maximum period for the completion of the programme shall be five years from the date of joining the programme.

10 General Guidelines

10.1 Academic Integrity and Ethics

a. A student who has committed an act of academic dishonesty will be deemed to have failed to meet a basic requirement of satisfactory academic performance. Thus, academic dishonesty is not only a basis for disciplinary action but also is relevant to the evaluation of student's level of performance and progress.
b. Where there has been violation of the basic ethos and principles of academic integrity and ethics, the Director/ Board of Examiners/ Course coordinators may use their discretion in terms of disciplinary action to be taken.
c. Academic dishonesty includes, but is not necessarily limited, to the following –
d. Cheating or knowingly assisting another student in committing an act of cheating;
e. Unauthorized possession of Examination materials, destruction or hiding of relevant materials;
f. Act of plagiarism;
g. Unauthorized changing of marks or making on examination records.

10.2 Attendance

a. Students are required to attend and participate in all scheduled class sessions, guest lectures, workshops, outbound learning programs and club/ forum activities of both academic and non academic nature.
b. Students may be dropped from the programs due to excessive and non-intimated absences.
c. Students must notify the program coordinator in writing, the reasons for absence, if any, from class sessions, activities and assessment components.
d. On notification of absences (including anticipated absences), the Director/ Programme coordinator would determine whether the absences could be rectified or whether it is possible to satisfactory complete the subject with the number of identified absences.

10.3 General

a. The students are expected to spend a considerable amount of time in research, reading and practice.
b. All students are expected to develop and maintain a positive professional attitude and approach throughout the professional attitude and approach throughout the programme and in conduct of all other activities.
c. Attendance alone is not sufficient. Students are expected to participate, to help the class learn and understand the topics under consideration.
d. Food and drinks are not permitted in the classroom/ conference hall.
e. All students are expected to dress as per stipulated dress code.

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -I						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA101	Programming in C++	**4**	3+1+0	70	30	100
MCA102	Algorithms and Data Structure using C++	**4**	3+1+0	70	30	100
MCA103	Discrete Mathematics and Numerical Analysis	**4**	3+1+0	70	30	100
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
MCA104	Computer Organization and Architecture	**4**	3+1+0	70	30	100
MCA105	Operating System Architectures and Concepts	**4**	3+1+0	70	30	100
GE(GENERIC ELECTIVES)						
LAB COURSES						
MCA106	Programming in C++ LAB	**2**	0+0+2	35	15	50
MCA107	Algorithms and Data Structure using C++LAB	**2**	0+0+2	35	15	50
		24		**420**	**180**	**600**

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -II						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA201	MS.Net PART I	**4**	3+1+0	70	30	100
MCA202	Relational Database Management Systems	**4**	3+1+0	70	30	100
MCA203	Research Methodology	**4**	3+1+0	70	30	100
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
MCA204	Mini Project I	**4**	3+1+0	70	30	100
MCA205	Data Communication and Networking	**4**	3+1+0	70	30	100
GE(GENERIC ELECTIVES)						
LAB COURSES						
MCA206	MS.Net PART I LAB	**2**	0+0+2	35	15	50
MCA207	Relational Database Management Systems	**2**	0+0+2	35	15	50
		24		**420**	**180**	**600**

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -III						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA301	Programming in Core JAVA	**4**	3+1+0	70	30	100
MCA302	Web Designing and Scripting Language	**4**	3+1+0	70	30	100
MCA303	Elective I	**4**	3+1+0	70	30	100
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
MCA304	Operations Research	**4**	3+1+0	70	30	100
MCA305	Theory of Computation	**4**	3+1+0	70	30	100
GE(GENERIC ELECTIVES)						
LAB COURSES						
MCA306	Programming in Core JAVA	**2**	0+0+2	35	15	50
MCA307	Web Designing and Scripting Language	**2**	0+0+2	35	15	50
		24		**420**	**180**	**600**

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -IV						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA401	Web Programming and Extensible Markup language	**4**	3+1+0	70	30	100
MCA402	Image processing	**4**	3+1+0	70	30	100
MCA403	Elective II	**4**	3+1+0	70	30	100
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
MCA404	Summer Internship	**4**	3+1+0	70	30	100
MCA405	Artificial Intelligence	**4**	3+1+0	70	30	100
GE(GENERIC ELECTIVES)						
LAB COURSES						
MCA406	Web Programming and Extensible Markup language	**2**	0+0+2	35	15	50
MCA407	Image processing	**2**	0+0+2	35	15	50
		24		**420**	**180**	**600**

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -V						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA501	Programming in Advance Java – J2EE	**4**	3+1+0	70	30	100
MCA502	MS .Net Part II	**4**	3+1+0	70	30	100
MCA503	Elective III	**4**	3+1+0	70	30	100
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
MCA504	Industrial/Company/Professional Training	**4**	3+1+0	70	30	100
MCA505	Research paper publication in the field of specialization	**4**	3+1+0	70	30	100
GE(GENERIC ELECTIVES)						
LAB COURSES						
MCA506	Programming in Advance Java – J2EE LAB	**2**	0+0+2	35	15	50
MCA507	MS .Net Part II LAB	**2**	0+0+2	35	15	50
		24		**420**	**180**	**600**

MASTER OF COMPUTER APPLICATION - MCA						
SEMESTER -VI						
Subject Code	**Subject**	**Credit 1 Cr= 1 hrs**	**L+T+P**	**Univ. Exam Marks**	**Int. Marks**	**Total Marks**
CORE COURSES						
MCA601	SYSTEM DEVELOPMENT PROJECT	**4**	3+1+0	70	30	600
DSE (DISCIPLINE SPECIFIC ELECTIVES) /CHOICE BASED						
GE(GENERIC ELECTIVES)						
LAB COURSES						

MCA101

Programming in C++

Course Objectives:

1.To teach efficient storage mechanisms of data for an easy access.
2.To design and implementation of various basic and advanced data structures.
3.To introduce various techniques for representation of the data in the real world.
4.To develop application using data structures.
5.To teach the concept of protection and management of data.
6.To improve the logical ability

Learning Outcomes:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various do mains like DBMS, compiler construction etc.
4. Students will be able to use C++ in real time application.

MODULE I : Overview of Object Oriented System, Concept of class, object, abstraction, inheritance, polymorphism and Encapsulation, OOP Paradigm and Advantages, Comparison between Functional Programming and OOP Approach, Overloading, Comparison between C++ and C.

MODULE II : Introduction to C++, Identifier and keywords, Constants, Basic program construction, input/output using cin/ cout; preprocessor Directives; Comments, integer, character, float data types manipulators, Arithmetic operators; Library functions. Variable declaration, statements, expressions, input and output, conditional expression loop statements, breaking control statements C++ Operators, type conversion, Defining a function, types of functions, Structure, Enumerated Data Types, simple functions, Passing arguments to and returning values from functions, Reference Arguments, Overloaded functions, Inline functions, Default Arguments, Variable and Storage classes, Returning by reference, Storage class specifier, recursion, Arrays, structures, pointers and structures, unions.

MODULE III : Classes, member functions, objects, Specifying & using class & object, Constructors, copy constructors, public, private & protected, constructors, destructors, objects as function Unary & Binary operators, Data conversion, Pitfalls of overloading & Conversion. Pointers and classes, nested classes, inline member functions, static class member, friend functions, Inheritance, derivation, Derived class and their constructs, Diamond Problem, overriding member functions, class hierarchies, Inheritance Visibility Specifiers.

MODULE IV : Dynamic memory allocation, pointer to objects, new-delete, Linked-Lists, Persistent objects; Polymorphism, compile time and runtime polymorphism, virtual functions, pure virtual functions, , Streams and files, Virtual, friend and static function; the this pointer; streams; string, character, object I/O; I/O with Multiple objects; File pointers; Disk I/O with member function; Error Handling.

MODULE V : Generic function – template function, function name overloading, container classes, member access control, container types, the array string, the ordered collection, the stack, the queue,

iteration methods, linked list of objects, creating a container class, Exception handling and Namespaces.

Text Books

- K. R. Venugopal, "Mastering C++", Tata Mgraw Hill.
- Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publications.

Reference Books

- D. Ravichandran, "Programming with C++", TMH, 1996.
- BjarneStrautrup, "The C++ Programming Language", Addition- Wesley Publication Company,1995.
- BarkakatiNabajyoti , "Object Oriented Programming in C++", Prentice Hall of India, 1996
- D. Parasons, "Object Oriented Programming with C++", BPB Publication.
- Schildt Herbert, "C++: The Complete Reference", 4th Ed., Tata McGraw Hill.
- YeshwanthKanetkar, "Let us C++", BPB Publications.

MCA102

Algorithm and Data structure using C++

Course Objectives:

1.To teach efficient storage mechanisms of data for an easy access.
2.To design and implementation of various basic and advanced data structures.
3.To introduce various techniques for representation of the data in the real world.
4.To develop application using data structures.
5.To teach the concept of protection and management of data.
6.To improve the logical ability

Learning Outcomes:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various do mains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc.

MODULE I : Introduction to Algorithm Design and Data Structure, Design & analysis of algorithm, Top down and Bottom-up approaches to algorithm design, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space. Algorithm Concepts Objectives of algorithms, Concept of a well posed problem, Recursive and iterative algorithms, Divide, conquer and glue, Greedy method, branch & bound. Representation of array (single &multi dimensional arrays), Address calculation using column & row major ordering, representation of stacks & Queues using arrays and their operations, circular queues, Applications of arrays, Implementation of 1-D arrays, Row and Column Major implementations of 2-D, 3-D and n-D arrays.

MODULE II : Definition of Data Structure, Types & characteristics of Data structures, Abstract Data Type (ADT), Applications of arrays, stacks & queues, conversions from Infix to postfix & prefix and evolution of prefix expressions using stack. Stack as a ADT, operations on stack, Stack implementation using array, Applications of Stack: Polish and reverse Polish notations, Recursion,

Queue as ADT, Operations on Queue, and Types of queues: Linear Queue, Circular Queue, Priority Queue, and Double Ended Queue, Queue implementations.

MODULE III : Linked list, Concept of a Linked List, Singly linked list (Operations on list), Linear Single and Double lists, Linked stacks and queues, polynomial representation and manipulation using linked list, Application : Reading and writing polynomials, polynomial addition, Circular linked list and doubly linked list, traversal – searches, insertion and deletions, Generalized list, sparse matrix representation using generalized list structure.

MODULE IV : Trees, Concepts of a Tree, Tree as ADT, Definitions of n-ary, binary trees, Strictly, Binary Tree, Complete Binary Tree, Almost Complete Binary Tree, Weight of a tree, Level of a node, Height/Depth of a Tree. Operations on tree, Tree Search Algorithms, Binary Search Tree, Tree traversal Algorithms, Logical level of binary search tree, BST transversal methods (Preorder, Postorder and Inorder), Recursive and non-recursive algorithms for traverse method, Insertion into and deletion from a BST and their implementation, preorder and Postorder, traversal, Insertion in Threaded tree, B-tree (Insertion and Deletion algorithms).

MODULE V: Searching and Sorting, Sequential and binary searches, Indexed search, Hashing schemes, Sorting methods: Bubble Sort, Sequential Sort, Shell Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort. Definitions of vertex edge and Graph, Types of graphs directed / undirected, connected / disconnected, cyclic / acyclic, Representation of graphs: Adjacency matrix, linked list

Text Book:

- A Michael Berman, "Data Structures via C++: Objects by Evolution",

Reference Books:

- Michael T Goodrich and Roberto Tamassia, "Data Structures and Algorithms in C++"
- Alan J. Parkar, "Algorithms and Data Structures in C++",
- Peter Smith, "Applied Data Structures with C++ ",
- Jan L. Harrington, "Object Oriented C++ Data Structures for Real Programmers"

MCA103

Discrete Mathematics and Numerical Analysis

Course Objectives: Teaches student all concept of mathematics, how it is implemented in computers and what is the role of discrete in computers architecture

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Learning Outcomes: Students learn the concept of mathematics in computers.

MODULE I : Mathematical Logic, Sets Relations and functions: Mathematical Logic: Notations, Algebra of proposition and propositional functions, logical connective, Truth values and Truth table, Tautologies & Contradictions, Quantifiers. Set Theory: Introduction, Set operations, De-Morgan's law Cardinality and relation: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, surjection, Bisection, composition, of function, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

MODULE II : Lattices and Boolean Algebra Lattices as Algebraic System, Sub lattices, some special Lattices (Complement, Distributive, Modular). Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.

MODULE III : Groups Fields and Rings Groups: Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups, free subgroups, grammars, language. Fields & Rings: Definition, Structure, Minimal Polynomials, Irreducible Polynomials, Polynomial roots & its applications.

MODULE IV : Graphs: Simple graph, Multigraph & Psuedograph, Degree of a vertex, Types of graph, Sub graphs and Isomorphic Graphs, Operations of graphs, Path, Cycles and connectivity, Euler and Hamiliton Graph, Shortest Path Problems BFS(Breadth First Search), Dijkastra's Algorithm, Representation of Graphs, Planar Graphs.

MODULE V : Trees: Trees, properties of tree, Pendant vertices in a tree, spanning tree, Binary tree, Application of trees in computer science.

Text Books

- Swapan Kumar Sarkar, "A text book of Discrete Mathematics ", S. Chand Publicatons.

Reference books

- J.P Trembly and R.P Manohar.Discrete, "Mathematical structure with application to computer science",
- K.A Ross and C.R.B Wright, "Discrete Mathematics",
- Seymour Lipschutz Mare Lipson, "Discrete Mathematics" .
- C.Vasudev, "Graph Theory",

MCA104

Computer Organization and Architecture

Course Objectives:

This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems. Basic technical writing skills are also taught in this class. student should grasp the basic concepts of computer architecture and organization, and understand the key skills of constructing cost-effective computer systems. A student should learn how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs. A student should be able to articulate design issues in the development of processor or other components that satisfy design requirements and objectives. In addition, a student should experience use of design tools to model various alternatives in computer design. A student should

understand the basics of technical writing, and is able to construct a detailed tutorial paper on a selected topic related to computer engineering.

Learning Outcomes:

After completion of the course, the student will gain:

1. Ability to understand basic structure of computer.
2. Ability to perform computer arithmetic operations.
3. Ability to understand control unit operations.
4. Ability to design memory organization that uses banks for different word size operations.
5. Ability to understand the concept of cache mapping techniques.
6. Ability to understand the concept of I/O organization.
7. Ability to conceptualize instruction level parallelism.

MODULE I : Overview of Computer Hardware, basic structure of computer, concept of Von Neumann, various functional blocks, data representation and codes, Introduction to Number System and binary arithmetic, addition, subtraction, multiplication and division, floating point arithmetic, BCD addition and subtraction, Boolean algebra, Boolean expression and their simplifications Basic computer architecture, Functional Organization, Register organization, Arithmetic and logic unit, Central processing unit, Data Transfer and manipulation, Interrupts, RISC/CISC architecture.

MODULE II : Addressing modes, types of addressing modes, different types of instructions, Instruction Cycle, Memory-Reference Instructions, Register reference instructions, Input - Output Instructions, Arithmetic and Logic Unit, Introduction to memory Unit, control unit and Instruction Set, Working with an ALU, Concepts of Machine level programming, Assembly level programming and High level programming, Concepts of subroutines and subroutine calls.

MODULE III : Central Processing Unit, Introduction and its basic structure, General Register Organization, Functional blocks, Fetch and Execution cycle, Instruction sequencing, Introduction to CPU design, Instruction interpretation and execution, Micro-operation and their RTL specification, Hardwired control CPU design, Micro programmed control CPU design, microinstructions and their encoding, Arithmetic and Logic Unit, circuit diagram for arithmetic operations, BCD adders and subtractors.

MODULE IV : Memory and storage, Processor Vs memory speed, static and dynamic memory, High-speed memories, access time, read only memories, Memory Hierarchy, Main Memory, Cache memory, Associative memory, Interleaved memory, Virtual memory and Memory management hardware. Concepts of semiconductor memory, CPU-memory interaction, organization of memory MODULEs, secondary storage memory, floppy disks, magnetic disks, paging.

MODULE V : Input/output organization, Addressing I/O devices, data transfer and synchronization, interrupt handling, I/O channels and interfacing, I/O devices, printers, VDU, keyboard, mouse etc. Peripheral devices, Asynchronous, Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA) , I/O processor. Programmed controlled I/O transfer, Interrupt controlled I/O transfer, DMA controller.

Text Books

- Morris Mano, “Computer System Architecture”, Prentice Hall Publications.

Reference Books

- William Stallings, "Computer Organization and Architecture", 4th Edition, Prentice Hall
- Of India Private Limited.
- Harry and Jordan, "Computer Systems Design and Architecture", Addison Wesley, Delhi,
- 2000.
- Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill.
- Michael J. Flynn, "Computer Architecture",
- Sajjan G. Shiva, "Computer Design and Architecture",

MCA105

Operating System Architectures and Concepts

Course Objectives:

This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems. Basic technical writing skills are also taught in this class. student should grasp the basic concepts of computer architecture and organization, and understand the key skills of constructing cost-effective computer systems. A student should learn how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs. A student should be able to articulate design issues in the development of processor or other components that satisfy design requirements and objectives. In addition, a student should experience use of design tools to model various alternatives in computer design. A student should understand the basics of technical writing, and is able to construct a detailed tutorial paper on a selected topic related to computer engineering.

Learning Outcomes:

After completion of the course, the student will gain:

1. Ability to understand basic structure of computer.
2. Ability to perform computer arithmetic operations.
3. Ability to understand control unit operations.
4. Ability to design memory organization that uses banks for different word size operations.
5. Ability to understand the concept of cache mapping techniques.
6. Ability to understand the concept of I/O organization.
7. Ability to conceptualize instruction level parallelism.

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Module-I

Introduction to Operating Systems, Types of operating systems, Major components of OS, BIOS, IVT, BIOS versions, Dual booting, Various Operating system architectures, Design Principles, Operating Systems for tiny devices (like mobile, tablets, set-top boxes).

Module-II

Introduction to Unix, versions of Unix, Kernel architecture, Unix Shell and its types, File system, Structure of the inode, etc. Memory Management in Unix.Process States, Process State Transition, Process Control Block (PCB), Parent-child relationship, The different segments of a process, Internal and external commands.

Module-III

Introduction to Linux, versions of Linux, Kernel architecture, File system- ext2, ext3, ResierFS, Journaling capability, Linux Booting process. Memory Management in Linux. Linux Shell and its types, concept of X-Window, KDE, Gnome. Understanding shells, batch commands, kill, ps, who, sleep.

Module-IV

Microsoft Windows families, Windows NT family, Windows File Systems, Booting Sequence, Windows 8 as Case Study: Architecture, aero and metro interfaces.Introduction to Apple's Mac OS X, basics, The Mac OS X File Structure, Units of Measure , storage, and organization methods.

Module-V

RealTime Operating System: Principles, Semaphores and Queues, Hard RealTime Scheduling Considerations, Saving Memory and Power, An example RTOS like uCOS (Open Source).

Text Books and References:

- "Operating Systems Design & implementation", Andrew S. Tanenbam, Albert S. Woodhull Pearson.
- Operating System Concepts (7th Ed) by Silberschatz and Galvin, Wiley, 2000.
- Sumitabha Das, Unix : Concepts and Applications, Third Edition, 1998, Tata McGraw Hill.
- Refer Research Papers and Google Scholar.

MCA201
MS .Net PART I

Course Objectives: Teaches student the concept of .NET framework and related Technology. They will be able to develop program using this framework.

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Learning Outcomes: Students are well versed with . NET technology.

MODULE I: The Microsoft .NET Framework and related technologies, .NET history, evolution of C/S architecture, Overview of .NET, Common Language Runtime (CLR), Development environments for the .NET technologies, NET Architecture, Base class Libraries, MSIL, Role and functionalities of CLR, namespaces, .NET Assemblies.

MODULE II: C# Application Basics: Command line and VS.NET compilation, C# Fundamentals, Basic classes, declarations, conditionals, loops, arrays, strings, enumerations, structures, OOPS in C#, Encapsulation, inheritance, polymorphism,

Exceptions, Object Lifetime, constructor and destructor Operator Overloading, garbage collection, Interfaces and collections How and why to use them, Callback Interfaces, Delegates, and Events, indexing, pointer.

MODULE III: Access Specifiers in C#, public, private, protected, internal, protected internal, use of this in case of constructor, object chaining, pointer arithmetic, call by value and call by reference, Nested class, Local class, nested structure, instance verses static constructor, const vs. read only keyword, Finalize, exceptions and exception handling, defining and throwing own exceptions, Abstract classes, exploring polymorphism, operator overloading and virtual methods.

MODULE IV: Understanding console Input and Output, Difference between Convert and Parse ,Working with String Class, using String class methods, for reading and writing, building Strings, Introduction to Interfaces, Classes versus Interfaces, using and defining interfaces, using multiple interfaces, using Explicit interface members, working with Events, Delegates and Indexers, , getting directory and system environment information, working with Math routines, working with Files, copying a File, getting information about a File, understanding streams, creating and opening files, working with simple data files, understanding the order for reading files.

MODULE V:GUI application using C#, Introduction to Win Forms, Getting started with Win Forms and its role in .NET environment, Generating events and event handlers, multiple event handler, Classes in the .Net Framework for GUI Environment, Working with Controls Like Combo box, list box, button, label, Textbox, picture box, Grid View, ,Radio Button, Check Box, Date and time tool , data validation using tools, Creating Menus, status bar, dialog boxes, creation of composite controls, list and tree view with Multiple document interface, Data base connectivity in C# using ADO.Net , ADO.Net framework, ADO Vs ADO.Net, ADO.Net Objects, Manipulating the data using Data Adapter and Dataset, Executing Complex SQL statements, Data Access technologies Comparisons DAO, RDO, ADO and OLEDB.

Text/Reference Books:

- C# and the .NET Platform by Andrew Troelsen, ISBN 1-59059-055-4
- "Microsoft .NET for Programmers"from Manning
- Review: "Introducing Microsoft .NET" By Microsoft Press ManoharKamath
- Learning C#, Author Jesse Liberty, O'Reilly & Associates
- Advanced C# Programming, Author Paul Kimmel, Osborne McGraw-Hill
- A Programmer's Guide to .NET, Author AlexieFedoroy, Addison-Wesley

MCA202

Relational Database Management Systems

Course Objectives:

On completion of this course, a student will be familiar with fundamental knowledge of, and practical experience with, database concepts. Includes study of information concepts and the realization of those concepts using the relational data model. Practical experience gained designing and constructing data models and using SQL to interface to both multi-user DBMS packages and to desktop DBMS packages.

Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.
3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of the relational data model.
5. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
6. Formulate, using relational algebra, solutions to a broad range of query problems.
7. Formulate, using SQL, solutions to a broad range of query and data update problems.
8. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

9. Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
10. Use a desktop database package to create, populate, maintain, and query a database.
11. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Module-I

Relational Model: Introduction - Structure of Relational Data Base - Relational Algebra - Relational Calculus. Relational Query Languages - Introduction - Codd's Rules - Structured Query Language - Embedded Structured Query Language. ER Model - Basic Concepts - Conversion of ER Model into Relations - ER Diagram Symbols.

Module-II

Data Base Design: Database Development Life Cycle. Functional Dependency and Decomposition - Functional Dependency - Decomposition. Normalization - Introduction - Normalization - Normal Forms - BCNF - 4 NF - 5 NF.

Module-III

Introduction of structured query language- Retriving data using the SQL select statement- Restricting and sorting data - Using single row function to customize output. - Reporting aggregated data using the grout function. - Displaying data from multiple tables – sub queries to solve problems - set operators - Manipulating data - Using DDL statements to create and manage tables - Creating other schema objects - Managing objects with data dictionary - Controlling User access - Managing schema objects - Manipulating large data sets - Generating report by grouping related data

Module-IV

Query Processing and Optimization: Introduction - Query Processing - Syntax Analyzer - Query Decomposition - Query Optimization. Transaction Processing and Concurrency Control.

Data Base Recovery Systems: Introduction - Recovery Concepts - Types of Failures - Types of Recovery - Recovery Techniques. Data Base Security.

Module-V

Distributed Data Base Systems: Introduction - Distributed Data Bases - Architecture of Distributed Data Bases. Emerging Data Base Technologies: Internet Data Bases - Digital Libraries - Multimedia Data Bases - Mobile Data Bases - Spatial Data Bases.

Text Books

- S.K. Singh, "Database Systems Concepts, Design and Applications", Pearson Education Pte. Ltd., New Delhi: 2006.
- C.J. Date and others, "An Introduction to Database Systems", Eighth Edition, Pearson Education Pte. Ltd., New Delhi: 2006.
- Abraham Silberschatz, "Database Systems", McGraw Hill International, 1997.

MCA203

Research methodology

Course Objectives:

The primary objective of this course is to develop a research orientation among the scholars and to acquaint them with fundamentals of research methods. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes

discussions on sampling techniques, research designs and techniques of analysis. Some other objectives of the course are:

- To develop understanding of the basic framework of research process.
- To develop an understanding of various research designs and techniques.
- To identify various sources of information for literature review and data collection.
- To develop an understanding of the ethical dimensions of conducting applied research.
- Appreciate the components of scholarly writing and evaluate its quality.

Learning Outcomes:

At the end of this course, the students should be able to:

- understand some basic concepts of research and its methodologies
- identify appropriate research topics
- select and define appropriate research problem and parameters
- prepare a project proposal (to undertake a project)
- organize and conduct research (advanced project) in a more appropriate manner
- write a research report and thesis
- write a research proposal (grants)

MODULE I: Research Meaning, objective, Types of Research, research approach, significances of research, research process, criteria of good research, research problem, research design.

MODULE II: Sampling techniques: Sampling theory – types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling. Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data

MODULE III: Statistics in Research – Measure of Central tendency – Dispersion – Skewness and Kurtosis in research, Hypothesis – Fundamentals of Hypothesis testing – Standard Error

MODULE IV: Para metric tests: Testing of significance – mean, Proportion, Variance and Correlation – testing for Significance of difference between means, proportions, Chi-square tests

MODULE V: Research Report: Types of reports – contents – styles of reporting – Steps in drafting reports – Editing the final draft – Evaluating the final draft.

Reference Books:

- Statistical Methods - S.P. Gupta
- Research Methodology Methods and Techniques - C.R. Kothari
- Statistics (Theory and Practice) - B.N. Gupta
- Research Methodology Methods and Statistical Techniques

MCA204

MINI PROJECT I

Course Objectives: Teaches students how to develop real time application software in real time

Learning Outcomes: Students are ready to develop and apply their projects in real time.

MCA205

Data Communication and Networking

Course Objectives:

At the end of the course, the students will be able to:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Learning Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

MODULE I : Introduction: The use of Computer Network-Network Hardware, LANs, WANs, Wireless network, Internetworks, Network software, Protocol Hierarchies, Design issues for Layers, Interfaces & services, CO & CL services, service primitives, relationship of services to protocol, OSI reference model, TCP/IP reference model. Example networks – Novell NetWare, Internet, X. 25, IEEE standards.

MODULE II : The Physical Layer: The theoretical basis of data communication-Fourier Analysis, Bandwidth-limited signals. The maximum data rate of a channel, Transmission Media-magnetic media, Twisted-pair, Baseband Coaxial Cable, Broad-band coaxial cable, fiber optics, Line of Sight transmission, Communication satellites, Analog Transmission, tree Telephone System, Modems, RS-232C & RS-449, The Medium Access Sublayer: Local and Metropolitan Area's Networks Static Channel allocation in LAN's and MAN'S Dynamic channel allocation in LAN's and MAN'S Network Protocols-persistent and Non Persistent CSMA, CSMA with collision detection, Collision free protocol, BRAP- Broadcast Recognition with alternating priorities, MLMA-The Multi-level Multi-access protocol, binary countdown, Limited-connection protocol - The adaptive tree walk protocol, IEEE standard 802 for local area network-IEEE standard 802.3 and Ethernet, IEEE standard 802.4 token bus, IEEE standard 802.5 token ring, comparison of local area networks, FDDI, Wireless LAN- 802. 11

MODULE III: The Data Link Layer: data link layer issues-services provided to the network Layer, Framing Error Control, Flow Control, Link Management, error detection and Correction-Error-Correcting Codes, error-detecting codes. Elementary data link protocols-An Unrestricted simplex.

Protocol, A simple stop and wait protocol, A simplex protocol for a noisy channel, Sliding window protocols- A one bit sliding window protocol, A protocol using Go Back N, A protocol using selective repeat Protocol performance-performance of the sop and wait protocol, Performance of the sliding window protocol, Example of the data link layer- the data layer in public networks-the data link layer in the Internet

MODULE IV: The Network Layer: Network Layer design issues-services provided to the transport layer, Internal organization of the network layer, Routing Congestion, Internetworking, Routing Algorithms, Congestion-Control algorithms, Pre-allocation of buffers, Packet discarding, Isarithmic, Congestion control, flow control, Choke packets, deadlocks. Examples of the network layer- the network layer in public networks, the network layer in Internet

MODULE V: The Transport Layer: Transport layer design issues-services provided to the session layer, quality of services, the OSI transport service primitives, transport protocol, elements of transport protocols, addressing, establishing connection, releasing connection flow control & buffering, multiplexing, crash recovery, examples of transport layer, transmission Control Protocol TCP). The Presentation Layer: Presentation layer design issues-Data representation, text Compression, Network security and privacy, Public Key Encryption, Secrecy and Digital Signature with Public Key encryption

Text Books:

- Andrew Tenanbaun, "Computer Networks", PHI Publications
- William Stallings, "Data and Computer Communication", PHI Publications.

Reference Book

- BehrouzForouzan, "Data communication and Networking", McGraw-Hill.

MCA301
Programming in Core JAVA

Course Objectives:

- programming in the Java programming language.
- knowledge of object-oriented paradigm in the Java programming language.
- the use of Java in a variety of technologies and on different platforms.

Course Outcomes:

:

1. knowledge of the structure and model of the Java programming language, (knowledge)
2. use the Java programming language for various programming technologies (understanding)
3. develop software in the Java programming language, (application)
4. evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

MODULE I: Introduction to java programming An overview of Java: Object Oriented Programming, History of java, Features of Java, Java Virtual Machine, Java Environment: Java Development Kit, Java Standard Library, introduction to java.lang package, Data Types, Variables: Declaring a variable, Dynamic Initialization, The scope and life time of variable, Type conversion and Casting: Narrowing and Widening Conversions, Numeric Promotions, Type Conversion Contexts; Operators: Arithmetic Operators, Relational Operators, Logical Operators, Bit wise Operators, Conditional Operators, new operator, [ ] and instance of operator. Control Statements: Java's Selection statement, Iteration Statement, Jump Statement, Array: Declaring Array variables, constructing an Array, Initializing an Array, Multidimensional Arrays, Anonymous Arrays.

MODULE II: Define the Class and interface -Introducing Classes: Class Fundamentals, Declaring Object, Assigning Object Reference Variables, Defining Methods, method overloading, Using objects as parameter, Constructor, Garbage collection and it's algorithms, finalize () method, System.gc() and Runtime.gc(). Inheritance: Inheritance basic, method overloading, object reference, this and super keyword, Chaining constructor using this, use of super, Member accessibility modifier: public, protected, private and default accessibility of member.Package: Define package, CLASSPATH, importing package, Abstract class and abstract methods, Interface: Define an interface, Abstract class Vs Interface, implementing interface, extending interface, variable in interface, Overview of nested class: Top level nested class and interface, Non static inner class, Local class, Anonymous class.

MODULE III: Exception handling and Multithreading -Exception Handling: Exception Hierarchy, Exception types, Exceptions vs Error Uncaught Exception, Using try and catch, multiple catch, nested try block, throw, and throws, finally. Multithreading: creating Thread, Using Thread Class and Implementing Runnable Interface, Difference between Thread class and Runnable Interface, Thread priority, synchronization, Thread Scheduler, Running & yielding, sleeping and waking up, waiting and notifying, suspend and resume, miscellaneous method in thread class.

MODULE- IV : Input output, Networking and Fundamental class of java Object class, String class, StringBuffer class, Wrapper class, Math class, Collection: Collection interface, List interface, Set interface sorted interface, Array List class, Liked List class, Tree Set, Comparator, Vector, Stack. Input output classes and interface: File class, Reader class, Writer class, InputStream class, OutputStream class, Random AccessFile class, various ways for reading from and writing into a file, Object Serialization. Networking: Socket overview, Client/Server, Proxy Server, Network class and interface, TCP/IP client socket, TCP/IP Server socket, URL Connection, Datagrams, Datagram Packets.

MODULE V: GUI programming using SWING- Applet: Applet and Application program, Difference between an Applet and a standard program, Creating Applets, Applet Life Cycle, Applet and Thread, Supplying Applet parameter, Using Images and Sound in Applets, JAR files, Applet Security. Introducing the AWT and SWING: Overview of the java.awt, javax. swing package, Component and Containers: Component, Container, JPanel, JApplet, Window, JFrame, and JDialog classes. Working with Graphics, Working with Fonts, Working with Colors, GUI Control Components: Button, Canvas, Checkbox and Checkbox Group, Choice, JList, JLabel, Scrollbar, JTextField and JTextArea, JFrame, JMenuBar, JMenu and JMenuItem. Layout Management: Layout Management Policies, Flow Layout, Grid Layout, Border Layout, Card Layout, Grid Bag Layout, Customized Layout. Event Handling: Overview of Event Handling, Event Hierarchy, Event Delegation Model, Event Listeners, Event Adapter classes, Low Level Event Processing.

Recommended Books:

- The Complete Reference J2SE - Herbert Schildt, Publisher- TMH
- A Programmer Guide to Java - Khlid A. Mughal, R.W. Rasmussen. Publisher- Addison Wesley
- Introduction to HTML by - Kamlesh N. Agarwala, O.P.Vyas, P A. Agarwala. (KitabMahal Publications).
- Web Enabled Commercial Application Java 2 - Ivan Bayross Publisher- B.P.B.

MCA302
Web Designing and Scripting Language

Course Objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project - based experience needed for entry into web application and development careers.

Course Outcomes:

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

MODULE I: Introduction: The World Wide Web (WWW), URL, Web Server, Communicating with the web server, concept of Client and Server Side, Web application development: Static & Dynamic web pages, Hypertext Markup Language, HTML History, STRUCTURAL ELEMENTS OF HTML DOCUMENTS: Header tags, body tags, Titles, HTML Tags for: Page background, Heading tags H1...H6, Paragraph <P>, Font, Rotating messages(Marquee), Line Break
, Section Separator <HR>, Different type of Lists: Numbered list, Non-Numbered lists, Definition lists. FORMATTING HTML DOCUMENTS: Physical Styles (Bold, Italic, Under Line), MANAGING IMAGES IN HTML: Image format (quality, size, type),TABLES IN HTML DOCUMENTS: Tags used in table definition, Tags used for border thickness, Tags used for cell spacing, Tags used for table size, Dividing tables with lines, Dividing lines with cells , Cell types: Titles cells, Data Cells. Concept of Hyperlink in HTML Documents: Links with images and buttons. MULTIMEDIA: Audio files and acceptable formats(AIFF, AU, MIDI, WAVE), Inserting audio files, Video files and acceptable formats(MPEG, Quick Time, Video for Windows), Inserting video files, Screen control attributes(WIDTH, HEIGHT, ALIGN). MANAGING FORMS: Interactive forms, Creating data entry forms, Concept of Frames

MODULE II: CSS in a Nutshell, the Benefits of CSS ,How CSS Works ,Rule Syntax ,Adding Styles to a Document ,Key Concepts ,Specifying Values, Browser Support , Type (Element) Selector - Contextual Selectors, Class and ID Selectors, Attribute Selectors, Font Family ,Font Size ,Other Font Settings ,Text Transformation (Capitalization) Text Decoration, Line Height, Text Alignment Properties, Text Spacing, Text Direction, Margins, Borders, Padding, Foreground Color, Background Color, Background Images, The Essence of Tables, Styling Tables, Borders, Table Layout (Width and Height), Table Display Values, Styling Background, Styling Lists, CSS Box Model.

MODULE III: What is Java Script, What can't you do with JavaScript? Java "vs" JavaScript, The hierarchy of JavaScript Objects, Window Object, document Object, Outputting Text with JavaScript, Using Arrays to Refer to Forms, Setting the bgColor & fgColor Properties, location Object, history Object, history and location Objects Example. Navigator properties, Data Type, parseInt(), parseFloat(), Variable, Variable Concatenation Example, Expression and operators, Example using the conditional operator, JavaScript Object, String Object, JavaScript String Manipulations Example, HTML string methods, Math Object, Using PI and Sqrt, Calculating the Square or Square Root, Date Object, Date object Example , JavaScript Built – in Functions, Three Types of Dialog Boxes in JavaScript.

MODULE IV: Event handler, Incorporating JavaScript into your HTML pages, Mehod1 : <Script> tag, Method2: Placing JavaScript within, HTML tags, Modularizing, Event Handlers, Attributes for the <SCRIPT> tag, Hiding scripts from other browsers, Java Scripting Commenting, Java Script and the HTML layout the concept of Program Control, Introduction to if – else Branching , while Loop : more about while loops, for loops : Calculating the sum of the digits, Nested for loops , Multiplication Table (more Nested for loops), Functions : with no parameters, with parameters- passing arguments, this keyword, returning values "multiple" returns, Variable Scope, Local – vs – Global Variables, Functions and their location within a document, Functions at work, Recursive Functions, The Document Object Model: What Does VBScript Manipulate, History and Background of the DOM, Properties, Methods, Events and Collections, Internet Explorer 5.x DOM, Event Handlers: Top-Down vs. Event-Driven Programming, Mouse Events, Keyboard Events, Validation and Error Handling.

MODULE V: PHP-Introduction to PHP, History, Web Browser, Web Server, Xampp, Installation and Configuration files, Syntax, Operators, Variables, Constants, Control Structure, Language construct and functions, Function – Syntax, Arguments, Variables, References, Returns and Variable Scope, Arrays- Enumerated Arrays, Associative array, array iteration, Multi-dimensional array, Array function and SPL, Date and Time functions, OOP's – Instantiation, Modifiers, Inheritance, Interfaces, Exceptions, Static Methods and Properties, Auto load, Reflection, Type Hinting and Class Constance, String and Patterns- Quoting, Matching, Extracting, Searching, Replacing and Formatting, Web Features- Sessions, Forms, GET and POST data, Cookies, HTTP Headers. Advance PHP technologies: Ajax Basics, Sending data to PHP with Ajax, Prototype- Utility functions, Ajax object and Form Object, Smarty- variables, Variable Modifiers, Built-in Functions, custom functions, Config files, Joomla, CakePHP - MVC Overview, Naming Conversions, Model, V\view, Controller, Helpers, Scaffolding an Data Validation, Introduction to Web Services.

Reference Books:

- Web Redesign: Workflow that Works
- HTML & XHTML: The Complete Reference Guide, 5th Edition
- The Non-Designer's Web Book, 3rd Edition
- VBScript Concepts and Techniques
- 'The Unfair Advantage Book on Winning the Search Engine Wars', An e-Book fromPlanet Ocean Communications
- Web Design in a Nutshell, Second Edition by Jennifer Niederst Robbins, SecondEdition September 2001
- Learning Web Design: HTML, Graphics, and AnimationA Beginner's Guide to HTML, Graphics, and Beyond by Jennifer NiederstRobbinsPHP:
- The Complete Reference, By- Steven Holzner

MCA303
Elective I

- Advanced DBMS
- Principle of Communication Systems

Elective I
Advance DBMS

Course Objectives:

On completion of this course, a student will be familiar with fundamental knowledge of, and practical experience with, database concepts. Includes study of information concepts and the realization of those concepts using the relational data model. Practical experience gained designing and constructing data models and using SQL to interface to both multi-user DBMS packages and to desktop DBMS packages.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.
3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of the relational data model.
5. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
6. Formulate, using relational algebra, solutions to a broad range of query problems.
7. Formulate, using SQL, solutions to a broad range of query and data update problems.
8. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
9. Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
10. Use a desktop database package to create, populate, maintain, and query a database.
11. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

Module I- Purpose of Database Systems ; View of Data ; Database Languages ; Relational Databases ; Database Design ; Object based and semi structured databases ; Data Storage and Querying ; Transaction Management ; Database Architecture ; Database Users and Administrators ; Overall Structure ; History of Database Systems; overview of functional dependency and normalization

Module II- Query Processing ; Overview ; Measures of Query Cost ; Selection Operation ; Sorting ; Join Operation ; Other Operations ; Evaluation of Expressions, Query Optimization; Introduction; Transformation of Relational Expressions ; Catalog Information for Cost Estimation ; Statistical Information for Cost Estimation ; Cost based optimization ; Dynamic Programming for Choosing Evaluation Plans ; Materialized views

Module III- Indexing and Hashing; Basic Concepts; Ordered Indices ; B+ Tree Index Files; BTree Index Files; Static Hashing; Dynamic Hashing ; Comparison of Ordered Indexing and Hashing; Index Definition in SQL; Multiple Key Access

Module IV- Advance application development- Performance Tuning, Performance Benchmarks, Standardization, E-Commerce, Legacy Systems ,Advanced Data Types and New Applications - Temporal Data, Spatial and Geographic Database, Multimedia Databases, Mobility and Personal Databases

Module V-Advanced Transaction processing-Transaction-Processing Monitors, Transactional Workflows, High-Performance Transaction Systems- Main memory databases, Real-Time Transaction Systems; Long-Duration Transactions Transaction management in multidatabase systems

Suggested Books:

1. Data Base Management System - Alexis & Mathews [Vikas publication]
2. Database System - Henry Korth
3. Database System - Bipin Desai
4. Database System - C.J. Date
5. Oracle and Developer 2000 - Ivan Bayross

Text Books:

1. Fundamentals of Database Systems, Author: RamezElmeZElmasri and Shamkant 2. B.Navathe - Third Edition, ISBN : 981-4050-9, Publisher:Addition-Wesley.
3. H. F. Korth and A. Silberschatz: Database Systems & Concepts, McGrawHill Publications.

Reference Books:

1. R. Elmasri, S. B .Navathe: Fundamentals of Database Systems, Benjamin/Cummings Publishing Company.
2. Stefano Ceri, G. Pellagatti: Distributed Databases Principles & Systems, McGrawHill.

Elective I

Principle of Communication Systems

Course Objectives:

This course introduces students to: (i) the essential approaches, fundamental concepts and design issues in communication engineering. The course emphasizes the understanding of engineering principles. Mathematics is used only at a level that is absolutely necessary; (ii) basic concepts of modulation techniques including amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) that are widely used in analogue communication systems, and basic techniques for analyzing such systems in the time and frequency domains; (iii) basic concepts of a digital communication system including sampling theorem, pulse code modulation (PCM) and principles of digital data transmission, and basic techniques for analyzing such systems in the time and frequency domains.

Course Outcomes:

On successful completion of this course students will be able to:

- Analyse communication systems in both the time and frequency domains.
- Have familiarity with amplitude modulated and angle modulated communication systems and be able to analyse their performance in the presence of noise.
- Understand source coding, information theory and Shannon's theorem.
- Have familiarity with various digital modulation systems and their properties, including bandwidth, channel capacity, transmission over bandlimited channels, inter-symbol interference (ISI), demodulation methods, and error performance in the presence of noise.
- Have knowledge of error correcting codes, including block codes.
- Understand engineering fundamentals of photogeneration, photodetection, lightwave propagation, for optical communications.

Module-I

Introduction to communications systems, analog and digital communication systems, Applications of communication systems, Introduction to Wireless/mobile/radio Communications Systems: Evolution, Analog-to-Digital Conversion: Sampling theorem, Pulse-Amplitude Modulation, Channel bandwidth for PAM signal, Quantization of signals, Pulse-code modulation (PCM), The PCM system, Companding, PCM signals, Differential PCM.

Module-II

Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power, distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation.

Module-III

Examples of Wireless Communication systems: paging system, cordless

systems, cellular systems, Comparison of common wireless communication systems, Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Block diagram of Transmitter and Receiver.

Module-IV

Digital Modulation Techniques: Binary Frequency-Shift Keying (BFSK), Binary Phase-Shift Keying (BPSK), Differential Phase-Shift Keying (DPSK), Quadrature Phase-Shift Keying (QPSK), Quadrature Amplitude Shift Keying (QASK), Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FH-SS), performance of DS-SS, performance of FH-SS.

Module-V

Basic Principles of Satellite Communication: an overview of satellite system, satellite frequency bands for communication, Communications via satellite, characteristic features of communication satellites, Coverage area and satellite networks, Geometric distances, Communication time, and satellite visibility. Orbital Theory: Orbital mechanics, locating the satellite in the orbit w.r.t. earth look angle determination.

References

1. Jordan Edwards C. and Balmain Keith G., "Electromagnetic Waves and Radiating Systems", Prentice Hall (India).
2. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson.
3. Haykin S & Moher M., "Modern wireless communication", Pearson, 2005.

MCA304

Operations Research

Course Objectives:

Operations research (OR) has many applications in science, engineering, economics, and industry and thus the ability to solve OR problems is crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modeling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach students about how to formulate, analyze, and solve mathematical models that represent real-world problems.

Course Outcomes:

- Formulate a real-world problem as a mathematical programming model
- Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum ow problems
- Understand the applications of, basic methods for, and challenges in integer programming
- Understand how to model and solve problems using dynamic programming
- Model a dynamic systemas a queuing model and compute important performance measures
- Learn optimality conditions for single- and multiple-variable unconstrained and constrained non-linear optimization problems, and corresponding solution methodologies

Syllabus:

MODULE I: Introduction to Linear Programming - Construction of the LP Model - Graphical LP Solution; The Simplex Method : Standard LP Form and its basic solutions - the Simplex Algorithm, Artificial Staring Solution, Special Cases in simplex method application.

MODULE II: Duality Analysis: Definition of the Dual Problem - Relationship between the Optimal, Primal and Dual Solutions, Dual Simplex Method - Primal - Dual Computations -; Transpiration Model and its variants: Definition of the Transportation Model ,solution, test for optimality - the Assignment Model - Hungaraian assignment method.

MODULE III: Network Models: Scope of Network Applications - Network Definitions, Minimal Spanning Tree Algorithm, Shortest Route Problem, CPM and PERT.

MODULE IV: Forecasting Models: Moving Average technique, Exponential smoothing, regression.

MODULE V: Decision Analysis: Decision - Making under certainty - Decision - Making under Risk, Decision under uncertainty; Simulation Modelling: Monte Carlo Simulation, Generation of Random Numbers, Method for Gathering Statistical observations.

Text Books /Reference Books:

- "Operations Research" - An Introduction by Hamdy A Taha, Prentice Hall India.
- "Operation Research"- Shaum Series.
- "Principles of Operation Research" Harvey M. Wagner, EEE.
- "Operation Research", Frederick s. Hillier. CBS.

MCA305
Theory of Computation

Course Objectives:

Understanding the inherent capabilities and limitations of computers is a fundamental question in computer science. To answer this question, this subject will define formal mathematical models of computation, and study their relationships with formal languages. Topics will consist of three central areas of the theory of computation: automata, computability, and complexity. Students will learn several formal mathematical models of computation along with their relationships with formal languages. In particular, they will learn regular languages and context free languages which are crucial to understand how compilers and programming languages are built. Also students will learn that not all problems are solvable by computers, and some problems do not admit efficient algorithms. Throughout this course, students will strengthen their rigorous mathematical reasoning skills.

Course Outcomes:

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

1. Define languages by abstract, recursive definitions and by regular expressions.
2. Design a finite automaton to recognize a given regular language.
3. Transform a language into regular expression or finite automaton or transition graph.
4. Define deterministic and nondeterministic finite automata.
5. Prove properties of regular languages and classify them.
6. Determine decidability, finiteness and equivalence properties.
7. Define relationship between regular languages and context-free grammars.
8. Building a context-free grammar for pushdown automata.
9. Determine whether a given language is context-free language or not.
10. Prove properties of context-free languages.
11. Design Turing machine and Post machine for a given language.
12. Discuss the concept of computability.

MODULE I: Review of mathematical preliminaries, Relations, functions, set theory, predicate and prepositional calculus, and principle of mathematical induction/strong mathematical induction.

MODULE II: Formal Languages, Phrase structured grammar and their classification, Chomsky hierarchy, closure properties of families of languages, regular grammar, properties of regular sets, finite automata NFA, DFA & 2DFA, FSM with output, Determinism and Non determinism, FA minimization and related theorems.

MODULE III: Context free grammar and their properties, derivation tree, simplifying CFG, unambigufying CFG, CNF and GNF of CFG, push down automata, Two way PDA, relation of PDA with CFG, Determinism and Non determinism in PDA and related theorems.

MODULE IV: Concept of Linear Bounded Automata, context sensitive grammars and their equivalence; Unrestricted grammars and their equivalence with TM, determinism and non determinism in TM, TM as acceptor/generator/algorithms and related theorems, Multi tape, multi track TM, automata with two push down store and related theorems.

MODULE V: Introduction to Complexity theory Introduction to recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Russell's paradox, Church's hypothesis, post correspondence problem, undecidability and some non-computable problems.

Text Books:

- Hopcroft and Ullman: Introduction to automata theory, Languages & Computation, Narosha Publication house.
- Mishra & Chandrashekharan: Theory of Computer Science, Automata Languages & computation, 2nd Ed PHI, New Delhi.

Reference Books:

- LewishPapadimitra: Theory of Computation, Prentice hall of India, New Delhi
- Liu C.L: Elements of Discrete Mathematics, McGraw Hill.(3)
- Hopcropt, Rajeev Motwani and Ullman: Introduction to Automata theory, languages and computation.

MCA401

Web programming and XML

Course Objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using JSP/ servlet and XML technologies. Students will gain the skills and project - based experience needed for entry into web application and development careers.

Course Outcomes:

- Students are able to develop a dynamic webpage by the use of java script and XML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

MODULE –I : Web architecture and HTTP, History of World Wide Web, Hyper Text Transfer Protocol, SMTP, FTP, Hyper Text Markup Language, Introduction to XML, Benefit of XML over HTML, Web Architecture Using XML, Difference Between SGML, HTML and XML, Advantage and Future of XML, Advantage of XML, Heterogeneity, Flexibility, Information Modeling Static Vs Dynamic Modeling, Component of an XML Document, Identifying the Rule for Creating XML Document, Displaying XML, Transforming XML.

MODULE – II : Electronic Data Interchange and EAI, Scope of EDI in E – Commerce, Processing Instruction, Element Content, Attribute Comment Data Types Available in XML ,CDDATA, PCDATA Well Formed and Valid Documents, XML Parser, Validating and Non Validating Parser, Element Attribute and Entity Declaration DTD's Documents type Declaration & Document type Definition Why DTD's Internal and External DTD's Building Our Own DTD, The SYSTEM and PUBLIC Keywords Using the URI and Inline DTD Together, Declaration Style + * and Qualifier Attribute Data Type, #IMPLIED, #FIXED and # REQUIRED.

MODULE- III : What is Namespaces, Namespace Declaration, use and benefit of it Issues With DTD's Advantages of XML schemas created using XSD Benefit of XSD over DTD's Support and Validation of XML using Version Parsers, Simple types including Atomic, Last and Union, Complex type including Element Restrictions min Occurs Max Occurs available constraining facets in the XSD Schema and their Use Import and Include What is XSLT, XSLT Syntax , Cascading Style Sheet CSS Vs XSLT, Benefit and Difference of XSLT over XSLT, Templates, Style sheet value – of, for Each, sort, Working of XSLT Processor Element, Attribute, Text, Select, Template, Calling Template, Conditional Processing Looping, XML Parse XSLT Template rule.

MODULE – IV : X Path Overview Major Features of X Path Tree Structure, Path Expression, X Path in java ,NET and PHP Tools for X Path, What is X Query, X Query Use Cases, Advantages of X Query, Structure of X Query Expression, for, let, Order by and Return Clause, X Query Built in Function Built-in Aggregate and String Functions, X Query in java.

MODULE – V : Implementation of DOM in MSXML Parser, Tree Structure of Document, XML DOM Object and Method, The Document Object in Script, Viewing and Adding Elements on XML tree Using XOM Handling Dom Events, Various types of DOM Nodes.

MCA402
Image processing

Course Objectives:

This course is an introduction to the fundamental concepts and techniques in basic digital image processing and their applications to solve real life problems. The topics covered include Digital Image Fundamentals, Image Transforms, Image Enhancement, Restoration and Compression, Morphological Image Processing, Nonlinear Image Processing, and Image Analysis. Application examples are also included.

Course Outcomes:

Upon completion of this course, students will be familiar with basic image processing techniques for solving real problems. Student will also have sufficient expertise in both the theory of two - dimensional signal processing and its wide range of applications, for example, image restoration, image compression, and image analysis.

MODULE I - INTRODUCTION

Fundamental Steps in Image Processing: Element of visual perception, a simple image model, sampling and quantization, some basic relationships between pixel, image geometry in 2D, image enhancement in the spatial domain. Digital image representation – image models, image types, image quality – colour models- Image acquisition – image sampling and quantization – pixel relationships – satellite image processing.

MODULE II – BASICS OF DIGITAL IMAGE PROCESSING

Fundamental steps in Digital Image Processing – grey level transformation – Histogram equalization – multi image operation – spatially dependant Transformation – templates and convolution – Transformation – Image enhancement techniques – image restoration.

MODULE III -MORPHOLOGICAL ALGORITHMS

Line detection, edge detection, gradient operator, edge linking and boundary detection, thresholding, region-oriented segmentation, representation schemes like chain codes, polygonal approximations, boundary segments, skeleton of a region, recognition and interpretation patterns and pattern classes, decision theoretic methods, introduction to neural network

MODULE IV - IMAGE COMPRESSION

Introduction – Principle of compression – Types of compression – Runlength Encoding – Huffman Coding – Modified Huffman Coding – Modified READ – LZW – Arithmatic Coding – JPEG – Other State-of-the-Art Image Compression – Image Compression Standard Fie Formats.

MODULE V - PATTERN RECOGNITION

Introduction, System Component, Complexity of Pattern Recognition, Object Representation, Feature Detection, Recognition Strategies – Classification, Matching, Feature Indexing. Verification – Template matching, Morphological Approach, Symbolic, Analogical Methods. Digital Image Processing Software – MATLAB, EASI/PACE, ERDAS Imagine.

REFERENCES BOOKS

1. Rafael C. Gonzalez, Richard.E, "Digital Image Processing (3rd Edition") Woods Prentice Hall, 2007.
2. Anji Reddy.M, Hari Shankar.Y, "Textbook of Digital Image Processing", BS Publications, 2006.
3. Robert Shcowebgerdt , "Remote sensing models & methods for image processing", III edition, 2004.
4. William K. Pratt, Digital Image Processing: PIKS Inside (3rd ed.), John Wiley & Sons, Inc., 2001
5. M.A. Joshi, Digital Image Processing: An Algorithmic Approach, Prentice-Hall of India, 2006
6. B. Chandra and D.D. Majumder, Digital Image Processing and Analysis, Prentice-Hall of India, 2007

MCA403

Elective II

- Data ware housing and Data Mining
- MANET and Wireless Sensor Network

Data Warehousing and Data Mining

Course Objectives:

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply preprocessing methods on raw data.
3. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:

Students who complete this course should be able to

1. Process raw data to make it suitable for various data mining algorithms.
2. Discover and measure interesting patterns from different kinds of databases.
3. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

MODULE I: Data warehousing Definition, usage and trends, DBMS vs. data warehouse, Data arts, Metadata, Multidimensional data mode, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations.

MODULE II: Data warehouse process & architecture, OLTP vs. OLAP, ROLAP vs. MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

MODULE III: Data warehouse implementation, computation of data cubes, modelling OLAP data, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse. Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications.

MODULE IV: Data mining query languages, data specification, specifying knowledge, hierarchy Specification, pattern presentation & visualization specification, data mining languages and standardization of data mining.

MODULE V: Data mining techniques: Association rules, Clustering techniques, Decision tree knowledge discovery through Neural Networks & Genetic Algorithm, Rough Sets, and Support, Victor Machines and Fuzzy techniques. Mining complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Databases and mining Word Wide Web.

Text /Reference Books:

- Data Warehousing In the Real World; Sam Anahory& Dennis Murray; 1997, Pearson
- Data Mining- Concepts & Techniques; Jiawei Han &MichelineKamber- 2001, Morgan Kaufmann.
- Data Mining Techniques; ArunPujar; 2001, University Press; Hyderbad.
- Data Mining; Pieter Adriaans&DolfZantinge; 1997, Pearson,
- Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, McGraw Hill.
- Data warehousing System; Mallach; 2000, McGraw Hill.
- Building the Data Warehouse; W.H. Inman, 1996, John Wiley & Sons.
- Developing the Data Warehouses; W.H Ionhman,C.Klelly, John Wiley & Sons.
- Managing the Data Warehouses; W.H.Inman, C.L.Gassey, John Wiley & Sons.

Elective II
Mobile Ad hoc Network (MANET) and Wireless Sensor Networks (WSNs)

Course Objectives:

This course covers major aspects of ad hoc and sensor networking, from design through performance issues to application requirements. It starts with the design issues and challenges associated with implementations of ad hoc and sensor network applications. This includes mobility, disconnections, and battery power consumption. The course provides a detailed treatment of proactive, reactive, and hybrid routing protocols in mobile wireless networks. It also covers the IEEE 802.11 Wireless LAN and Bluetooth standards and discusses their characteristics and operations. About half of the course time is spent on wireless sensor networks (architecture, design, protocols, and applications). Through a project, the course gives students hands-on experience in designing a mobile ad hoc network using the NS2 network simulator.

Course Outcomes:

- Student has an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure based networks.
- Student have an understanding of the principles and characteristics of wireless sensor networks (WSNs).
- Student understand how proactive protocols function and their implications on data transmission delay and bandwidth consumption.

- Student understands how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- Student understands how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- Student understand how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- Student are familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.
- Student have acquired skills to design and implement a basic mobile ad hoc or wireless sensor network via simulations or programming of PDAs.

Module - I

Type of Networks: Infrastructure-based and Infrastructure-less, Introduction to Wireless Communication, The Electro Magnetic Spectrum, Radio Waves & its Propagation, Radio Portion of the Electromagnetic Spectrum, Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Chirp Spread Spectrum, Narrowband/Single Frequency Radio and Wideband, Infrared, Bands in the Infrared, Application of Infrared in Communications, Microwave, Area of Application, Microwave Frequency Range & Bands.

Module - II

Wireless LAN, its Architecture, Types of Wireless LANs, Wireless LAN Standards: IEEE 802.11, European Telecommunications Standards Institute (ETSI), HiperLAN, Introduction to Wireless Local Loop (WLL), Wireless Local Loop (WLL) Standards: GSM, CDMA, TDMA, UMTS, Personal Handy-phone System (PHS), WiMAX or IEEE 802.16, Wireless Broadband Access Technology, Wireless PANs (Personal Area Networks), IrDA, Bluetooth, UWB, and ZigBee.

Module - III

Introduction to Mobile Ad hoc Network (MANET), Types of MANET, Applications, Medium Access Control, Routing protocols for MANET, Categorization of Routing Protocols for MANET, QoS in term of MANET, Classification of Attacks on MANETs.

Module - IV

Wireless sensor nodes and existing hardware, Operating systems for wireless sensor nodes, Node deployment options in WSNs, Topologies used for WSNs, Architectures for WSNs, WSNs lifecycle, Resource constraint nature of WSNs, Applications of WSNs, Existing standards for WSNs, Existing experimental tools for WSNs, Usability & reliability of experimental tools, Routing challenges & protocol design issues in WSNs, Existing protocols for WSNs, Protocol classifications for WSNs, Protocol evaluation factors, Theoretical aspects of major energy efficient protocols, Security issues in WSNs.

Module - V

Case Studies: Protocol work and Simulation in Linux Platform, Simulators: NS2, Mannasim Description. Performance Comparison of MANET & WSN Protocols under Specific Scenario conditions.

Reference

- William Stallings, "Wireless Communications & Networks", Second Edition, ISBN: 0-13-191835-4.
- Jochen Schiller, "Mobile Communications", Addison-Wesley, Chapter-4,7,9,10,11, Second Edition, 2004.
- A.K. Dwivedi, O.P. Vyas, "An Investigation on Protocols for Wireless Sensor Networks", Chapter No.: 11, pp. 285-329, Book: Wireless Sensor Networks: Current Status and Future Trends, CRC Press, Taylor & Francis Group, USA. ISBN: 9781466506060.
- A.K. Dwivedi, O.P. Vyas, "Wireless Sensor Networks: At a Glance", Chapter No.: 14, pp. 299-326, Book: Recent Advances in Wireless Communications and Networks, InTech, Austria. ISBN: 978-953-307-274-6. DOI: 10.5772/19005

<http://www.intechopen.com/books/recent-advances-in-wireless-communications-and-networks/wireless-sensor-network-at-a-glance>

MCA404
Summer Internship

MCA405

Artificial Intelligence

Course Objectives:

The course is designed to introduce both − (1) The traditional approach to machine learning using symbolic representations
& manipulations, i.e., knowledge representations and problem solving techniques. (2) Techniques and application of machine learning techniques to data mining.

Course Outcomes:

Upon completion of this course,

- students will be familiar with several powerful search techniques for automatically solving complex problems.
- Student will also have sufficient expertise in both the theory of machine learning and its application to data mining, so as to use these powerful techniques in a wide range of industrial contexts, for example, bioinformatics, electronic commerce, and finance.

MODULE I: Introduction to AI: AI problems, Underlying assumptions, What is an AI technique? Criteria for success, Problem spaces, Search, State space representation of several problems.

MODULE II: Heuristic Search Techniques: Generate and test, Hill climbing, Breadth first search Problem reduction, Constraint satisfaction, Means-ends analysis, Dependency directed backtracking.

MODULE III: Knowledge Representation Issues and Representation using Predicate Logic: Declarative Vs Procedural knowledge, representation and mappings, knowledge representation issues, predicate logic vocabulary, Representing simple facts in logic, Computable functions and predicates, Conversion of WFFs to clause form, Resolution, Matching-Unification algorithm.

MODULE IV: Representing Knowledge using Rules: Logic programming Forward Vs Backward reasoning, Matching-RETE matching algorithm, approximate matching. Symbolic reasoning under uncertainty- Introduction to non-monotonic reasoning. Logic for non-monotonic reasoning. Statistical reasoning-Certainty factors, Bayesian networks, Dempster- shafer theory, Fuzzy logic.

MODULE V: Knowledge Representation using Slot and Filler Structures: Frame problem semantic nets, Frames-property inheritance, multiple Inheritance tangled hierarchies, CD representation and Scripts. PROLOG: Facts, Rules, Control Predicates, Recursion in PROLOG,

Text Books / References Books:

- Artificial Intelligence - Elaine Rich & - Kevin Knight (TMH).
- Introduction to Turbo PROLOG Carl Towsrehd (BPB).
- Artificial Intelligence & Expert Systems Dan W.Patterson (PHI).

MCA501
JAVA Programming Enterprise JAVA

Course Objectives:

The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business. This course presents several advanced topics of the Java programming language, including Servlets, Object Serialization and Enterprise JavaBeans. In order to build robust client server applications you need to understand the basics of many of these topics.

Course Outcomes:

- Learn the basic concepts of Object-Oriented programming and how they are handled in Java.
- Covers techniques for better class construction
- Understand Exceptions. How and when they should be handled
- An overview of database access and details for managing information using the JDBC API

- Examines the use of Object Serialization
- Addresses how to use Remote Method Invocation
- A general overview of Reflection and its uses
- Will be introduced to Java security
- Learn how to use Servlet and JSP and XML with JSP
- Be able to create and use custom JSP tags.
- A presentation of Enterprise JavaBeans and how to use it
- Identify advanced concepts of java programming with database connectivity.
- Design and develop platform independent applications using a variety of component based frameworks
- Able to implement the concepts of Hibernate, XML & EJB for building enterprise applications.

MODULE I : Java Database Connectivity: JDBC architecture; Drivers, JDBC-ODBC bridge, native API partly java driver, Net Protocol all Java driver, Native protocol all Java driver; Connecting to Database; statements; Multiple result sets; Large data types; Handling Errors; SQL warning; Metadata, database meta data, result set meta data; Transactions; Stored procedure; Batch updates; Binary large objects; Character large objects.

MODULE II : Remote Method Innovation: RMI architecture; RMI Object services; Naming/registry service, object activation service, distributed garbage collection; Defining Remote objects; Key RMI classes for remote object implementations; Stubs and skeletons; Accessing remote object as a client; Remote method arguments and return values; Factory classes; Dynamically loaded classes; Configuring clients and servers for remote class loading; Loading class from Applets; Remote object activation, persistent remote references; Defining an activatable remote object, activatable class, implementing an activatable object, registering activatable objects, passing data with the Marshalled object; Activation groups, registering activation groups, assigning activatable objects to groups; Activation daemon, dual personality.

MODULE III : Java Servlets: Life cycle; HTTP Servlets, forms and interaction; POST, HEAD and other requests; Servlet responses; Servlet requests; Error handling, status codes; Security; Servlet chaining; Custom Servlet Initialization; Thread safety; Server side includes; Cookies; Session tracking; Http session binding listener; session contexts; Databases and non-html content; Request dispatching; Shared attributes; Resource abstraction.

MODULE IV : Java Naming and Directory Interface: JNDI Architecture; Context; Initial context class; Objects in a context; Naming shell application; Command Interface, Loading initial context; Running shell; Listing children of a context; Browsing a naming system; Listing binding of a context; Creating and destroying context; Binding objects; Accessing directory services; X500 directories; Dir context interface; Attributes and attribute interface; Modifying directory entities; Creating directory entities; Searching and search criteria; Search results; search controls; search command

MODULE V : Enterprise Java Beans: Roles of EJB; EJB Client; Object; Container; Transaction Management; Making EJB server aware of database transactions; Transaction isolation levels; EJB object implementation; Home and remote interface; Bean Implementation; Implementing Session Beans; Stateless versus stateful session beans; Optional transaction support; Implementing entity beans; Primary keys; Finder method; Persistent profile bean; Entity Context; life cycle, handles; Container managed persistence; Complex data structures; Deploying an EJB object; Container managed data mapping; Access control deployment attributes; Generating container class and deployment descriptor; Packaging EJB; Finding home interfaces through JNDI; Creating and finding beans; Client sede transactions; Changes in EJB 1.1 specification.

Text/Reference Books:

- Java Enterprise in a nutshell by David Flanagan and Jim Parley, O'Reilly Associates Inc.
- Complete Reference Java 2 Fifth Edition
- Mastering Enterprise Java Beans - Ed Romon 2nd Edition.

MCA502
MS.Net Part-II

Course Objectives:

This course is designed to provide the knowledge of Dot Net Frameworks along with C#. This course:

- Set up a programming environment for ASP.net programs.
- Configure an asp.net application.
- Creating ASP.Net applications using standard .net controls.
- Develop a data driven web application.
- Connecting to data sources and managing them.
- Maintain session and controls related information for user used in multi-user web applications
- Understand the fundamentals of developing modular application by using object oriented methodologies

- Use AJAX to create partial page updates that refresh only the parts of the Web page that have changed

Course Outcomes:

After completion of the course,

- the student will be able to use the features of Dot Net Framework along with the features of C#
- Successful students will able to design web applications using ASP.NET
- Successful students will be able to use ASP.NET controls in web applications.
- Successful students will be able to debug and deploy ASP.NET web applications
- Successful students will be able to create database driven ASP.NET web applications and web services

MODULE I: MS.NET Framework: Introduction, The .NET Framework - an Overview, Framework Components, Framework Versions, Types of Applications which can be developed using MS.NET, MS.NET Base Class Library, MS.NET Namespaces, MSIL / Metadata and PE files. The Common Language Runtime (CLR), Managed Code, MS.NET Memory Management / Garbage Collection, Common Type System (CTS), Common Language Specification (CLS), Types of JIT Compilers, Security Manager

MODULE II:

Web Programming fundamentals, Understanding & Publishing Web Application, Introduction to ASP.NET Web Application, Advantages of IIS Applications, Creating web application in IIS, Converting File System application to IIS Application, Using Virtual Directory, Publishing ASP.NET Website, Culture specific formatting, ASP.NET Architecture: What is AppDomain, Life Cycle of ASP.NET Page, How Control Manages its State, What is EnableViewState, How Control raises events, Event handling in Web Forms, Writing Custom Classes in WebApplication, ASP.NET Introduction & Controls:ASP.NET Introduction, First ASP.NET Application, Auto Postback Property, Event Handler Parameters, Dynamically intializing Controls ,IsPostBack property of Page class, ListControls, Comparison between HtmlControls and WebControls, Control Properties and Methods,FileUpload Control

MODULE III:

User Controls & Validation Controls: Overview of User Controls, Creating a User Control, Adding Properties to User Control, Adding Events to User Control, Using User Control in Web Form; Base Validator, Required Field Validator, Compare Validator, Range Validator, Regular Expression Validator, Custom Validator, Causes Validation Property, Grouping - Validation Group Property, Page.Validators and Page.IsValid, CSS & Themes: Work with CSS, Use Themes to Customize a Site, Name Skins within a Theme, Do server side Styles using ThemesAdd contents of a Theme and Skin, Apply themes and Profiles Master Pages: Introduction to MasterPage, ContentPlaceHolder and Content tags, Accessing controls of MasterPage in ContentPage, URL's in MasterPages, UniqueID and ClientID

MODULE IV:

ASP.NET State Management: Static Members, View State, Hidden Field in Form, Query String, HttpContext, Cookies-HttpCookie, Sessions-HttpSessionState, Application-HttpApplicationState, Summary of All Features, WebConfiguration File: Introduction to Configuration files, Page setting in web.config, Custom Errors, URL Re-Writing

MODULE V:

Database connectivity with web forms using MS SQL Server & DataBound Controls, Authentication & Authorization: What is Authentication and Authorization, Types of Authentication, Forms Authentication, Role based Authentication, Windows and Basic Authentication, What is ASP.NET Impersonation, Using location section in web.config

MCA503

Elective III

ADVANCED DATA WAREHOUSING AND DATA MINING

Course Objectives:

Students undergoing this course are expected to:

- Differentiate OnLine Transaction Processing and OnLine Analytical processing
- Learn Multidimensional schemas suitable for data warehousing
- Understand various data mining functionalities
- Inculcate knowledge on data mining query languages.
- Know in detail about data mining algorithms

Course Outcomes:

After undergoing the course,

- Students will be able to understand
- Design a data mart or data warehouse for any organization
- Develop skills to write queries using DMQL
- Extract knowledge using data mining techniques
- Adapt to new data mining tools.
- Explore recent trends in data mining such as web mining, spatial-temporal mining

MODULE I INTRODUCTION TO DATA MINING Introduction to Data Mining — Data Mining Tasks —Components of Data Mining Algorithms — Data Mining supporting Techniques — Major Issues in Data Mining —Measurement and Data — Data Preprocessing — Data sets

MODULE II OVERVIEW OF DATA MINING ALGORITHMS Overview of Data Mining Algorithms - Models and Patterns — Introduction — The Reductionist viewpoint on Data Mining Algorithms — Score function for Data Mining Algorithms- Introduction — Fundamentals of Modeling — Model Structures for Prediction —Models for probability Distributions and Density functions — The Curve of Dimensionality — Models for Structured Data — Scoring Patterns — Predictive versus Descriptive score functions — Scoring Models with Different Complexities — Evaluation of Models and Patterns — Robust Methods.

MODULE III CLASSIFICATIONS — Basic Concepts — Decision Tree induction — Bayes Classification Methods Rule Based Classification — Model Evaluation and Selection — Techniques to Improve Classification Accuracy — Classification: Advanced concepts — Bayesian Belief Networks- Classification by Back Propagation Support Vector Machine — Classification using frequent patterns.

MODULE IV CLUSTER ANALYSIS Cluster Analysis: Basic concepts and Methods — Cluster Analysis —Partitioning methods — Hierarchical methods — Density Based Methods — Grid Based Methods — Evaluation of Clustering — Advanced Cluster Analysis: Probabilistic model based clustering — Clustering High — Dimensional Data — Clustering Graph and Network Data — Clustering with Constraints.

MODULE V ASSOCIATION RULE MINING AND VISUALIZATION Association Rule Mining — Introduction — Large Item sets — Basic Algorithms — Parallel and Distributed Algorithms — Comparing Approaches — Incremental Rules — Advanced Association Rule Techniques — Measuring the Quality of Rules —Visualization of Multidimensional Data — Diagrams for Multidimensional visualization — Visual Data Mining —Data Mining Applications — Case Study: Tools such as DB Miner /WEKA/DTREG DM Tools

REFERENCES:

1. Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining: Concepts and Techniques", Third Edition (The Morgan Kaufmann Series in Data Management Systems), 2012
2. David J. Hand, Heikki Mannila and Padhraic Smyth "Principles of Data Mining" (Adaptive Computation and Machine Learning), 2005
3. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", 2003 4. Soman, K. P., Diwakar Shyam and Ajay V. "Insight Into Data Mining: Theory And Practice"

Elective III
Neural Network

Course Objectives:

This course aims at introducing the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence. This can be summarized as:

1. To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
2. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic
3. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Course Outcomes:

At the end of the course, students should be able to understand and appreciate:

- The role of neural networks in engineering, artificial intelligence, and cognitive modelling.
- Feed-forward neural networks of increasing complexity, gradient descent learning and extensions, learning and generalization theory
- Hopfield model of content-addressable memory, Hopfield-Tank approach to optimisation, resistive networks for vision models, complex dynamical learning models.
- Generalization and function approximation

- Competitive learning, Self-organizing feature maps
- have an understanding of the concepts and techniques of neural networks through the study of the mo s t important neural network models.
- have a knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks.
- be able to evaluate whether neural networks are appropriate to a particular application.
- be able to apply neural networks to particular applications, and to know what steps to take to improve performance.
- have knowledge of research literature on neural networks in one particular domain, and be able to put new work into context of that literature.

Module I

Introduction of Neural Network (ANN) , Motivation , Biological Neural Network , Single models , The artificial neuron model, Hopfield nets, Application of NN , Perception Network , Multilayer networks their variants and application , capacity of multilayer network.

Module II

Feedback network and feed forward networks their introduction, Back propagation Network (BPN); Introduction, aim, Learning Rule, Recurrent nets, Tree structure network, unsupervised learning, Hebbian learning

Module III

Competitive learning Feature mapping , self organizing maps, Adaptive Resonance Theory (ART); Introduction , ART fundamentals, basic architecture, ART1, ART2 , Conclusion recent trends and future directions

Module IV

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning – Machine Learning Approach to Knowledge Acquisition. Chromosome representation, encoding, decoding, Genetic operators: Selection, Crossover, Mutation, Elitism, Schema Theorem, EGA, Convergence theorem, real-coded GA, Ordered GA, Steady-state GA, Multi-objective evolutionary algorithms.

Module V

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

1. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.
2. Simon Haykin - Neural Networks: A Comprehensive Foundation
3. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.

MCA 504

Industrial/Company/ Professional Training

MCA 505

Research paper publication in the field of specialization

MCA601

System Development project (System Design and Implementation)

MSIT/MCA/601	Subjects	Project Work	Viva	Internal Assessment	Total
Max. marks	System Development project (System Design and Implementation)	520	110	270	900
Min. marks		284		121	405

- The work done by the students should be worthy enough to prove the duration of computer applications project as six months
- The Certificate of the company must specify the duration of at least 4 months.
- The project should be based on application of technical knowledge for attempting live problems.
- Students undergone for project have to send the confirmation letter from the company within 15 days of joining. This letter will consist of information regarding company name, guide name, project title, project start date etc.
- Two progress reports should be sent by the project leader of the company to the department during 6 months of project work.
- The Student will have to deliver a very formal seminar in the form of power point presentation and 2 copies of project report are to be submitted.