MAHATMA GANDHI UNIVERSITY
KOTTAYAM, KERALA

MASTER OF COMPUTER APPLICATIONS

REGULAR [3 YEARS]

REGULATIONS&SCHEME
For
AFFILIATED COLLEGES

(From 2017 admission onwards)

1. **Eligibility Conditions**

Qualifications

i)   A candidate seeking admission to MCA course must have

A pass with not less than 50% marks in any recognized regular bachelor's Degree course of minimum three years duration in any discipline with Mathematics at 10+2 level.

OR

A pass with not less than 50% marks in any recognized Regular Bachelors Degree course of minimum three years duration in any discipline with Mathematics/Statistics/Business Mathematics/ Business Statistics as one of the Subjects.

OR

A pass with not less than 50% marks in BCA/BSc Computer Science/ BSc Information Technology/ B.Techdegree of a minimum three years duration from a recognized University.

ii) Subject to the regulation relating to prescribed minimum of the respective qualifying examination, the minimum marks of admission to the course of studies shall be a pass in the case of SC/ST candidates.

iii) Candidates belonging to Socially and Educationally Backward Classes (SEBC) referred to GO(P)208/66/Edn dated 2-5-96 and subsequent amendments to orders issued by the Government and University shall be given a relaxation of 3% marks in the prescribed minimum for admission.

iv)   A relaxation of 5% marks from the prescribed minimum shall be allowed in the case of OEC Candidates.

v)   A relaxation of 5% marks from the prescribed minimum shall be allowed in the case of physically handicapped persons.

vi)   Candidates who have passed the qualifying examination in more than one chance in the subject (excluding languages) will have their percentage marks de-rated at the rate of 5% for every additional appearance for the purpose of ranking.

Candidates with such degrees awarded by the Mahatma Gandhi University or any other degree recognized as equivalent to degrees in(i)by the Mahatma Gandhi University also are eligible to apply.

Reservation of seats shall be as per rules prescribed in the relevant rules by the Directorate of Technical Education, Government of Kerala from time to time.

2.Duration of the Course

The course shall extend over a period of three academic years consisting of six semesters.

3. Requirements of attendance and progress

A candidate will be deemed to have completed the course of any semester only if**a) He/She has put in not less than 75% of attendance, b) His/Her progress and conduct have been satisfactory**.

4. Procedure for completing the Course

i. The academic year will be divided into two semesters, the odd semester normally commencing at the beginning of the academic year and even semester ending with the academic year.

ii. The Course work in the subjects of study of the odd semesters will ordinarily be conducted only in odd semesters and that of even semesters only in even semesters.

iii. A candidate may proceed to the course of study of any semester if and only if he has completed the course in the previous semester and has registered for the examination of the previous semester.

iv. A candidate who is required to repeat the course of any semester for want of attendance / progress or who desires to rejoin the semester after a period of discontinuance or who upon his own request is specially permitted to repeat the semester in order to improve his performance, may be permitted to join the semester for which he is eligible or permitted to join.

5. Assessment

i) The assessment will comprise of sessional assessment and university examination in certain subjects, and wholly sessional assessments in others, carrying marks as specified in the subject of study and scheme of assessment.

ii) A candidate shall be declared to have passed in any subject in full in any semester if he/she secures not less than 50% marks in sessional, not less than 40% marks in the University examination including project and viva and not less than 50% of the over all aggregate marks for the subject ie., university examination marks and sessional marks of the subjects put together.

iii)A student may be given the option to improve the marks obtained in theory subjects of any semester (except the sixth semester) by canceling all the theory examinations of the semester. There will be no provision to improve the sessional marks of any semester unless he repeats the semester.

vi) University examinations will be conducted at the end of each semester for subjects offered during the semester.

v) Semester examinations will normally be conducted in October/November and in April/May of each year.

vi) All Sessional work shall be valued and marks awarded on the basis of day to day performance, periodic tests and assignments. The allocation of sessional marks for individual subjects shall be on the following basis.

Theory Subjects		Practicals	
Attendance	10%	Attendance	10%
Assignments /Seminar	30%	Regular class work / Lab record / Class Performance	50%
Tests	60%	Tests	40%
Total	100%	Total	100%

The sessional marks allotted for attendance shall be awarded in direct proportion to the percentage of attendance secured by the candidate in the subject. **However, full sessional marks for attendance shall be awarded to those who are securing 80% of the attendance and above only**.

6. Normalization of Sessional Marks

For the MCA course, the maximum internal marks(awarded internally) and external marks(awarded by external examiner appointed by the university) for all theory/practical papers shall be 25 and 75 respectively, except for the following papers - MCA108, MCA 407, MCA508.

To enforce uniformity in the awarding of internal marks by all institutions, there is a need to stipulate rules for normalizing the marks so that the abnormal and unjust variations in sessional marks are controlled to a reasonable extent.

For MCA 108, MCA 407 and MCA 508, having only sessional assessment, the Head of the Institution should ensure that the class average does not exceed 80%. For the remaining papers the following normalization method shall be implemented by the University.

Normalization Method

The maximum percentage of internal marks of a candidate shall be limited to 40% above that of external marks secured by the candidate.
In the case of a candidate who fails to get the pass minimum or absent for external examination for a paper, the normalized internal marks shall be computed only when he/she gets through the new external examination and the internal marks will be computed as per the new external marks.

Illustration
Internal   Maximum Marks - 25   Pass Minimum -12.5
External   Maximum Marks - 75   Pass Minimum – 30
                Maximum Marks - 25   Pass Minimum - 10
Overall Maximum Marks - 100 Pass Minimum -50

Reg. No.	External		Max. % of internal eligible (% of external+40%)	Internal awarded by college	Internal marks after normalization
	Marks awarded out of 75	Percentage			
1	40	53%	93	20	20
2	15(failed)	20%	-	-	-
	30(Next appearance)	40%	80%	22	20(limited to 80%)
3	60	80%	100	21	21
4	Absent	-	-	-	-
	60(Next appearance)	80%	100	18	18

The above shall be computed using software and the normalized internal marks in the last column shall be carried over to the mark list.

7. University Exam Question Paper Pattern

The pattern shall comprise of 2 parts: **PART A** (10x3=30 marks) and **PART B** (5x9=45 marks).

Part A shall have 30 marks, in which the student is expected to answer 10 short questions (3 marks each) out of 12 questions **evenly prepared from all the five modules.** These questions can consist of definitions, theoretical concepts, short illustrative examples, block schematics etc.

Part B shall have 2 questions from each module, out of which the student has to answer one from each module (9 marks). These can be descriptive type questions, derivations, problems or collection of 2 or more small questions in a topic. This offers 50% choice to the students, yet forces him to study all the five modules.

8. Passing requirements/classification of successful candidates

i) A candidate shall be declared to have passed in any subject if he/she satisfies

clause 5(ii) above.

   a) If any candidatefails in want of either minimum marks for university examination or minimum marks for overall aggregate for any subject, he/she can appear for the supplementary examination at the ensuing chance only in the failed subjects alone.

   b) If any candidatefails in want of minimum marks for *sessional part*alone for any subject, he/she has to write supplementary examination for *both the sessional part and university examination in the ensuing chance only in the failed subjects alone till he gets a pass mark for that subject*. Sessional part of such candidates may be evaluated by the institution, considering

the marks for attendance already obtained, but new assessment should be done for seminar/assignment and tests along with the subsequent batch. The new sessional mark has to be forwarded to the university along with the sessional marks of subsequent batch.

    c) If any candidate fails in **MCA 108, MCA 407 & MCA 508**, having only sessional assessment, he/she has to redo the work for that subject along with the subsequent batch.

ii) A candidate who successfully completes the course and satisfy all the passing requirements of the six semesters within six academic years of joining the course will be declared to have qualified for the degree. However, in exceptional cases with genuine and convincing reasons, it is the discretion of the syndicate of the University to effect changes in this regard.

iii) A candidate who qualifies for the degree and secures not less than 75% of the aggregate of total marks of all the six semesters in the **first attempt** in all the subjects shall be declared to have passed the MCA Degree examination in **First Class with Distinction**.

iv) A candidate who qualifies for the degree and secures not less than 60% of the aggregate of total marks of all the six semesters shall be declared to have passed the MCA Degree examination in **First Class**.

v) All other successful candidates shall be declared to have passed the MCA Degree examination in **Second Class**.

vi) Successful candidates who complete the examinations with **Distinction shall be ranked** on the basis of the aggregate of the total marks of all six semesters.

9. Revision of Regulations

The University may from time to time revise, amend or change the regulations, curriculum, scheme of examinations and syllabi. These changes unless specified other wise will have effect from the beginning of the next semester following the notification by the University.

SCHEME OF THE PROGRAMME

Coding Structure: T: Theory; P: Practicals S: Seminar D: Dissertation V: VivaVoce

Example: MCA101T : MCA (Course) 101 (Paper Code) T(Theory Paper)

SEMESTER I

CourseNo.	Subject	No. of hours per week		Durat-ion of Exam in hrs	Sessional Marks Max.	Sem.Exam. Marks Max	Total Mark
		Lect	**Lab**				
MCA101T	Discrete Mathematics and Statistics	4	-	3	25	75	100
MCA102T	Fundamentals of Data Structures	4	-	3	25	75	100
MCA103T	Paradigms of Programming Languages	4	-	3	25	75	100
MCA104T	Digital Systems & Computer Architecture	4	-	3	25	75	100
MCA105T	Problem Solving and Programming in C	4	-	3	25	75	100
MCA106P	C Practicals	-	4	3	25	75	100
MCA107P	Data Structures through C - Practicals	-	4	3	25	75	100
MCA108T	English for Professional Communication	2			50	0	50
	Total	**22**	**8**				**750**

SEMESTER II

Course No.	Subject	No. of hours per week		Durat-ion of Exam in hrs	Sessional Marks Max.	Sem. Exam. Marks Max	Total Mark
		Lect	Lab.				
MCA201T	Optimization Techniques & Numerical Methods	4	-	3	25	75	100
MCA202T	Operating Systems	4	-	3	25	75	100
MCA203T	Database Management Systems	4	-	3	25	75	100
MCA204T	Data Communications & Networks	4	-	3	25	75	100
MCA205T	Web Technologies	4	-	3	25	75	100
MCA206P	DBMS Practicals	-	4	3	25	75	100
MCA207P	Web Technologies Practicals	-	4	3	25	75	100
	Total	**20**	**8**				**700**

SEMESTER III

Course No.	Subject	No. of hours per week Lect	No. of hours per week Lab.	Durat-ion of Exam in hrs	Sessional Marks Max.	Sem. Exam. Marks Max	Total Mark
MCA301T	Principles of Management & Accounting	4	-	3	25	75	100
MCA302T	Analysis & Design of Algorithms	4	-	3	25	75	100
MCA303T	Object Oriented Programming through Java	4	-	3	25	75	100
MCA304T	Software Engineering & Project Management	4	-	3	25	75	100
MCA305T	Object Oriented Analysis & Design	4	-	3	25	75	100
MCA306P	PHP Programming Practicals	-	4	3	25	75	100
MCA307P	OOPS through Java Practicals	-	4	3	25	75	100
	Total	**20**	**8**				**700**

SEMESTER IV

Course No.	Subject	No. of hours per week Lect	No. of hours per week Lab.	Durat-ion of Exam in hrs	Sess-ional Marks Max.	Sem. Exam. Marks Max	Total Mark
MCA401T	System Software	4	-	3	25	75	100
MCA402T	Data Mining	4	-	3	25	75	100
MCA403T	TCP/IP Protocols	4	-	3	25	75	100
MCA404T	Linux OS and Shell programming	4	-	3	25	75	100
MCA405E	Elective- I	4		3	25	75	100
MCA406P	Linux OS & Shell programming Practicals	-	4	3	25	75	100
MCA407D	Mini Project-Application Development	-	4	3	100	0	100
	Total	**20**	**8**				**700**

SEMESTER V

Course No.	Subject	No. of hours per week		Duration of Exam in hrs	Sessional Marks Max.	Sem. Exam. Marks Max	Total Mark
		Lect	Lab.				
MCA501T	User Interface Design	4	-	3	25	75	100
MCA502T	Knowledge Management & Business Intelligence	4	-	3	25	75	100
MCA503T	Enterprise Resource Planning	4	-	3	25	75	100
MCA504T	Advanced Java Programming	4	-	3	25	75	100
MCA505E	Elective - II	4	-	3	25	75	100
MCA506P	Advanced Java Programming Practicals	-	4	3	25	75	100
MCA507P	Python Programming - Practicals	-	4	3	25	75	100
MCA508S	Main Seminar – Current Trends	2			50	0	50
	Total	**22**	**8**				**750**

SEMESTER VI

Course No.	Subject	No. of hours per week		Duration of Exam in hrs	Sessional Marks Max.	Sem. Exam. Marks Max	Total Mark
		Lect	Lab				
MCA601D	Project	-	28	-	150	150	300
MCA602V	Viva-voce	-	-	-		100	100
	Total	**-**	**28**				**400**

<u>Elective I – Semester 4</u>

1. Microprocessor and Embedded Systems (E41)
2. Big Data Analytics (E42)
3. Cloud and Grid Computing (E43)
4. Social Network Analysis (E44)
5. Cryptography and Computer Security (E45)
6. Soft Computing (E46)

<u>Elective II – Semester 5</u>

1. Ad-hoc & Sensor Networks (E51)
2. Multimedia Systems (E52)
3. Information Security & E-Commerce (E53)
4. Digital Image Processing (E54)
5. Distributed Computing (E55)
6. Computer Graphics with Open GL (E56)

MCA 101T DISCRETE MATHEMATICS & STATISTICS

UNIT I
Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus; Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving ; Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

UNIT II
Set theory & Relations: Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering;
Elementary Combinatorics: Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, principles of Inclusion – Exclusion.

UNIT III
Recurrence Relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, The method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.
Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Kruskals Algorithm, Binary trees, Planar Graphs Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

UNIT IV
PROBABILITY THEORY - Random experiment-Conditional probability – independent event . Bayes theorem-Random variable - continuous and discrete – Probability density function – Distribution function – Special distributions – discrete and continuous distributions-TWO DIMENSIONAL RANDOM VARIABLE-Joint probability density – cumulative distribution – marginal probability – conditional probability.

UNIT V
Tests of hypothesis- parameter and statistic-sampling distribution – Estimation and testing of hypothesis-critical region and level of significance-Errors in testing of hypothesis-one tailed and two tailed tests-procedure for testing hypothesis- confidence interval-tests of significance of large and small samples-Student's t distribution- Snedecor's F distribution.

REFERENCES
- Discrete Mathematical Structures with Applications to CS; Tremblery, R.Manohar, TMH
- Discrete Mathematical for computer Scientists & Mathematicians , Molt, Kandel, Baker, PHI
- T.Veerarajan-Probability , Statistics and Random process(Third edition ,TMH)
- Sundarapandian - Probability, Statistics and Queueing theory, PHI
- Purna Chandrta Biswal – Probability and Statistics , PHI
- Elements of Discrete Mathematics, C L Liu, D P Mohanpatra,TMH
- Discrete Mathematical Structures, Kolman, Busby, Ross, 6th ed., PHI, 2009

MCA 102T   FUNDAMENTALS OF DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off. Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors. Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack., Applications of recursion in problems like 'Tower of Hanoi'.

UNIT II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues. Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

UNIT III

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm. Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

UNIT IV

Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting. Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees**.**

UNIT V

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

REFERENCES

- Horowitz and Sahni, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
- R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002 A. M. Tanenbaum, "Data Structures using C & C++", Prentice-Hall of India.
- K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
- Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.
- Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd.(Singapore)

MCA 103T   PARADIGMS OF PROGRAMMING LANGUAGES

UNIT I

Introduction -Language evaluation criteria, influences on language design, paradigms in programming, stages in translation;

Syntax Analysis - programming language syntax, regular expressions, finite automata, grammar types, derivation, grammar issues, recursive descent process, concrete and abstract syntax, LL grammar, LR grammar, programming the scanner and parser;

UNIT II

Semantics – Models, Referential Transparency, Lambda Calculus, Types & type systems, Attribute Grammar, Axiomatic Semantics, Mathematical Semantics, Transitional Semantics;

Imperative Programming Languages – Variables, Type Checking, Scope, Referencing Environments, Data Types, Arithmetic Expressions, Control Flow, Stack and Sub programs

UNIT III

OO programming Languages – C++ and its support for OOP; Java and OOPs, C# and OOPs, Ruby and OOPs, Python and OOPs, Event handling in Java, Programming in OO languages;

Functional Programming languages – LISP, SCHEME Language, Meta Language (ML), Haskell Language

UNIT IV

Logical Programming language – PROLOG, Extended Logic Programming,

Concurrent and Distributed Programming – FORK in UNIX, Threads in Java, Network Programming, Distributed Programming

UNIT V

Scripting Language- Pragmatics, key Concepts, Case Study: Python – values and Types, variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library;

REFERENCES:

1. Principles of Programing languages – A Paradigm Approach – Syed Buhari, McGraw Hill,
2. Concepts of Programming languages Robert W Sebesta 8/e, Pearson Education
3. Programming Language Design Concepts, D.A. Watt, Wiley Dreamtech

MCA 104T   DIGITAL SYSTEMS AND COMPUTER ARCHITECTURE

UNIT I

Number systems and code. Number systems - Efficiency of number system, Decimal, Binary, Octal, Hexadecimal conversion from one to another- Binary addition, subtraction, multiplication and division, representation of signed numbers, addition and subtraction using 2's complement and I's complement. Binary codes - BCD code, Excess 3 code, Gray code, Alpha-numeric code, Error detection codes, Error correcting code.

UNIT II

Logic Gates and Boolean Algebra. Logic Gates - Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams. Boolean Algebra - Basic laws and theorems, Boolean functions, truth table, minimization of boolean function using K map method. Combinational and Sequential Logic Circuits. Combinational circuits - Half adder, Full Adder, Parallel binary adder, Subtracter, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Parity bit generator, PLA. Sequential circuits - Flip Flops ; Registers and counters. Registers - Serial in serial out, Serial in Parallel out, Parallel in serial out, Parallel in Parallel out registers, Bidirectional shift registers, universal shift registers.

UNIT III

Computer Organisation: Basic structure of computers-Machine Instructions and programs: Memory Locations and addresses, Memory Operations, Instructions and Instruction sequencing, Addressing modes, Basic Input Output Operations, Subroutines. Central Processing Unit; Arithmetic & Logic Unit: Number Representation – Addition of positive numbers – Fast Adders – Signed Addition and Subtraction – Multiplication of positive numbers – Multiplication using Booth's algorithm - Fast Multiplication – Floating point numbers and Operations. The Processing Unit - Basic Concepts - Instruction execution cycle - sequencing of control signals - hardwired control - microprogrammed control - control signals - microinstructions- microprogram sequencing - Branch address modification- Pre fetching of microinstructions

UNIT IV

The Main Memory: Memory Hierarchy – Main memory - RAM-ROM – Cache Memory – Performance Considerations -Virtual Memory- Memory Management Requirements, Secondary storage – memory interleaving. Module IV Input / Output Organization: Accessing I/O devices - Interrupts: Interrupt processing – hardware interrupts –programmable interrupt controller – Vectored Interrupts - Interrupt nesting - Daisy chaining - Direct memory access (DMA): DMA operations & DMA Controller – Buses – Introduction to I/O interfaces.

UNIT V

Basic Parallel Processing Architecture - Flynn's Classification - SISD, MISD, SIMD, MIMD structures - Pipelining – Basic Concepts of pipelining, Instruction Pipelining, Hazards, Vector processing & Vector processors - Loosely Coupled & Tightly Coupled Systems - Instruction-level parallelism: Concepts of instruction-level parallelism (ILP), Superscalar, Superpipelined and VLIW processor architectures - Comparison of RISC and CISC.

REFERENCES:

- Digital logic and Computer design - Morris Mano, Prentice Hall of India, 2004.
- Digital Fundamentals - Floyd, Pearson Education, 2004.
- Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill.
- Digital computer Fundamentals - Thomas C Bartee, McGraw HillComputer Organization, V C Hamacher, Mc-Graw Hill International Edition, Fifth Edition.
- Computer Architecture: A Quantitative Approach - John Hennessy and David Patterson, Morgan Kaufmann Publishers Inc., Third Edition
- Computer System Architecture – M Morris Mano; Prentice Hall, Third Edition. Computer Organization and Architecture- William Stallings - Fifth Edition.

MCA 105T   PROBLEM SOLVING & PROGRAMMING IN C

UNIT I

Introduction to algorithm, flowchart, structured programming concept, programs – Compiler, Interpreter. Introduction to C Language: The C character set, identifiers and keywords, data types, how floats and doubles are stored, constants, variables and arrays, declarations, expressions, statements, Lvalues and Rvalues , type conversion, symbolic constants.

UNIT II

Operators and expressions: Arithmetic operators, unary operator, relational and logical operator, assignment operators, the conditional operator, type conversion, Library function Data input and output: Single character input, single character output, scanf, printf, puts gets functions, interactive programming. Control statement: Branching: if else statement, Looping, nested control structure, switch statement, break statement, continue statement, comma operator, goto statement.

UNIT III

Functions: Overview, function prototypes, passing arguments to a function, recursion. Program structure: Storage classes, automatic variables, external variables, static variables, multifile program. Arrays: Defining an array, passing array to functions, multidimensional arrays, strings: one dimensional character array, array of strings.

UNIT IV

Pointers: Fundamentals, void pointer, null pointer, passing pointers to a function, pointers and one dimensional arrays, dynamic memory allocation, operation on pointers, pointers and multidimensional arrays, array of pointers, pointer to an array, pointers and strings, structure pointer, pointers to function, pointers and variable length arguments list, passing functions to other functions. Structures and unions: Defining a structure, processing a structure, user defined data types, structure and pointers, passing structure to function, self-referential structures, and union.

UNIT V

Data files: Why files, opening and closing a data file, reading and writing a data file, processing a data file, unformatted data file, concept of binary file. Low level programming: Register variable, bitwise operations, bit fields. Additional features of C: Enumeration, Command line parameters, Macros, C Preprocessor.

REFERENCES

- The C Programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001
- Programming with C – Byron S Gottfried– Schaum's outlines 2nd Edition,2010
- Computer Science: A Structured Programming Approach Using C, Forouzan, 3 rd Cengage Learning 2007.
- C – How to Program, Deitel & Deitel, Pearson Education Asia, 6th Edition,2009
- Ansi C programming Bronson, Cengage learning, C2009
- Understanding Pointers in C- Yashavant Kanetkar – BPB publication, 2009
- Let us C - Yashavant Kanetkar – BPB publication C. 1997
- C by discovery – l s Foster – Pearson C 2005
- Working with C - Yashavant Kanetkar – BPB publication, 2008
- Instant C program – Ivor Horton – Wrox, 1995.

MCA 106P   C PROGRAMMING- PRACTICALS

Section A (Min 30 programs)

- Implementation of the various Data Types in C.
- Demonstration of Data type conversion (Hint: Usage of type casting).
- Implementation of various Storage Types.
- Demonstration of for loop.
- Demonstration of do...while loop.
- Demonstration of while loop.
- Demonstration of nested if (Hint: Use logical operators).
- Demonstration of switch... case structure.
- Implementation of arrays.
- Implementation of multidimensional arrays (Hint: implement matrix operation).
- Implementation of functions (Hint: Demonstrate call by value, call by schemes, passing of arrays).
- Demonstration of various string operations (Hint: Usage of user defined functions only allowed). Demonstration of pointer operations.
- Demonstration of recursion (Hint: GCD, factorial, Fibonacci series).
- Demonstration of Debugging a C program.

Section B (Min 20 Programs)

- Implementation of structures (Hint: simple structure operations, array of structures).
- Implementation of Union.
- Implementation of pointers to structures and unions.
- Demonstration of dynamic allocation of memory (Hint: malloc, calloc, realloc, free).
- Demonstration of sorting techniques (Hint: selection sort, bubble sort).
- Demonstration of searching techniques (Hint: linear search, binary search).
- Demonstration of bitwise operations.
- Demonstration of macro processing.
- Demonstration of various file operations. (Hint: Text file)
- Implementation of character counting, line counting and word counting for a file.
- Program to find the lengthiest line in a text file.

MCA 107P   DATA STRUCTURES PRACTICALS THROUGH C

Students are directed to develop a minimum of 40 Programs applying all Data Structure concepts studied in the Data Structures Theory paper.

Programs to represent sparse matrix manipulation using arrays.

Programs to represent Singly Linked List.

Programs to represent Doubly Linked List.

Programs to represent Circular Linked List.

Polynomial addition using Arrays and Linked List.

Programs to represent Stack operations using array and linked list

Programs to represent Queue operations using array and linked list

Programs for Conversion of infix to postfix.

Programs for Evaluation of Expressions.

Programs to represent Binary Tree Traversals.

Programs to represent Searching procedures (Linear search , Binary search and Interpolation search)

Programs to represent sorting procedures (Selection , Bubble , Insertion ,Quick , Heap , Merge)

Program to find the minimum cost spanning tree using Prim's Method.

Program to implement 8-Queens Problem.

MCA 108T   ENGLISH FOR PROFESSIONAL COMMUNICATION

Communication: Meaning and process of communication, importance of effective communication, barriers to communication. Types of communication, principles .of communication, essentials of effective communication.

Media of Communication: Written, oral, face-to-face, visual, audio Visual, merits and demerits of written and oral communication..

Communication Skills: Developing communication skills, Listening, Speaking, Reading-Writing (Oral & Written). Body language; Utility of aids in Communication.

Spoken Skills: Preparing for oral presentation, conducting presentations, Debates, Seminar, Speeches, Lectures, Interviews, Telephonic Conversation, Negotiations; Group Discussions.

Written Skills: Preparing of bio-data, seminar, paper, bibliography and official correspondence, Mechanics of writing, Formal & Informal writings, letters, paragraphing, precise, report writing, technical reports, length of written reports, organizing reports, writing technical reports; Creative writing;

REFERENCES:

1. Rajendra Pal and J.S. Korlahalli : "Essentials of Business Communication" , Sultan Chand & Sons Publishers, New Delhi.
2. U.S.Rai & S.M. Rai "Business Communications", Himalaya Publishing House.
3. Menzal and D.H. Jones "Writing a technical Paper", Mc Graw Hill, 1961.
4. Strategy and Skill "Business .Communication", Prentice Hall New Jersey, 1987
5. Scot Ober "Contemporary Business Communication", Wiley India.

MCA 201T   OPTIMIZATION TECHNIQUES AND NUMERICAL METHODS

UNIT I
Introduction and Overview of the OR Modeling Approach - The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering, data, Formulating a mathematical model, deriving solutions from the model, testing the model, Preparing to apply the model, implementation.
Introduction to Linear Programming - Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP),

UNIT II
Solving LPP - the Simplex Method - The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method, adopting to other model forms (Two Phase method, Big-M method), post optimality analysis.
Duality Theory and Sensitivity Analysis - The essence of duality theory, economic interpretation of duality, primal dual relationship, adapting to other primal forms, the role of duality in sensitive analysis, the dual simplex method

UNIT III
Transportation and Assignment Problems - The transportation problem, a stream line simplex method for the transportation problem, the assignment problem, a special algorithm for the assignment problem ; **PERT and CPM -** Network representation, Critical path (CPM) computations and PERT networks. **Game Theory -** The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, solving by linear programming, extensions

UNIT IV
Inventory Control- Determination of EOQ, Components, Deterministic Continuous & Deterministic Periodic Review Models, Stochastic Continuous & Stochastic Periodic Review Models. Sequencing- Two men two machines, Three Men Two Machines

UNIT V
Errors In Numerical Calculations Types Of Errors-Significant Digits-Programming Errors-Numerical Solution Of Non Linear Equations-Bisection Method-Regula Falsi Method-Newton Raphson Method –Fixed Point Method Of Iteration – Rates Of Convergence Of These Methods-Solutions Of Algebraic Equations-Guass Elimination Method-Relaxation Method-Gauss Seidel Iteration Method-Gauss Jordan Method- Polynomial Interpolation – Lagrange's Interpolation Polynomial-Divided Differences- Newton's Divided Difference Interpolation-finite Differences-Operators Δ , ∇, e, δ Gregory-Newton Forward And Backward Difference Interpolation Polynomials- Central Differences.

REFERENCES
1. Operation Research, Kanti Swaroop
2. Operation Research,V.K. Kapoor
3. Operation Research,Paneer Selvam,PHI
4. Operations Research, Hillier & Lieberman, TMH
5. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology.
6. Theory and Problems of Operations Research, Richard Bronson and Naadimuthu, Schaum's Outline, Tata McGraw Hill

MCA 202T   OPERATING SYSTEMS

UNIT I

Evolution of operating systems:-Serial processing, Batch Processing, multiprogramming. Types of operating systems-Batch Operating System, Multi programming-Time sharing, Real time, distributed operating systems. Operating Systems Structures:- Systems Components, Operating System Services, System Calls, System Programs, System Structures, Virtual Machines Processor Management:-Job and process concept, Operating system view of processes, process-state transition diagram, PCB; Threads, Operating system services. Process Scheduling:-Types of schedulers, scheduling and performance criteria, scheduling algorithms, multiple processor scheduling.

UNIT II

Inter process synchronization and communication-Concurrent Processes- need for inter process synchronization, critical section problem, mutual exclusion-mutual exclusion algorithms, semaphores-definition; busy wait implementation, monitors, inter process communication using messages. Deadlocks: -Definition –Deadlock characterization-Resource allocation graph, methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state-resource allocation graph algorithm, Banker's algorithm, deadlock detection, recovery from deadlock.

UNIT III

Memory Management:-Preliminaries-address binding, dynamic linking and loading, Overlays. Logical versus physical address space, Swapping, Contiguous allocation Paging-principles of page allocation. Structure of page table- hardware support, multi-level paging, hierarchical paging, inverted page table, shared pages. Segmentation-principles of operation, hardware, implementation of segment table, protection and sharing, fragmentation, segmentation with paging.

UNIT IV

Virtual Memory-Demand paging –performance. Page replacement-page replacement algorithms. Thrashing, Segmentation and paging implementation of virtual memory, hierarchical address translation tables and MMUS. Device Management:-Disk structure, Disk scheduling-FCFS-SSTF-C-Scan-Look, Disk management, Swap space management, Disk reliability.

UNIT V

File Management:-File structure, File types, File access, File attributes and File operations. Directories-Flat directory systems, hierarchical directory systems. File system implementation-Allocation methods, contiguous allocation, linked allocation, indexed allocation.

Case Study - Desktop OS - Linux & Windows, Mobile OS – Android and iOS

REFERENCES:

1. Abraham Silberschatz and Peter Baer Galvin,Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
2. Milan Milenkovic 'Operating systems' TATA Mc GrawHill.
3. Andrew S. Tanenbaum, "Modern Operating System, Prentice Hall India
4. Learning Android OS – Oreilly Publishers
5. Learning iOS – Oreilly Publishers

MCA 203T   DATABASE MANAGEMENT SYSTEMS

UNIT I

Need for a Database Management System - The file based system, Limitations of file based system, The Database Approach, The Logical DBMS Architecture , Three level architecture of DBMS or logical DBMS architecture, Mappings between levels and data independence, The need for three level architecture , Physical DBMS Architecture , DML Pre-compiler, DDL Compiler, File Manager, Database Manager, Query Processor, Database Administrator, Data files indices and Data Dictionary, Commercial Database Architecture , Data Models

UNIT II

The Relational Model - Domains, Attributes, Tuple and Relation, Super keys Candidate keys and Primary keys for the Relations, Relational Constraints, Domain Constraint, Key Constraint, Integrity Constraint, Update Operations and Dealing with Constraint Violations.
Relational Algebra - Basic Set Operation, Cartesian Product, Relational Operations, Entity Relationship (ER) Model , Entities, Attributes, Relationships, More about Entities and Relationships, Defining Relationship for College Database, E-R Diagram, Conversion of E-R Diagram to Relational Database

UNIT III

Relational Database Integrity- The Keys, Referential Integrity, Entity Integrity; **Redundancy and Associated Problems-** Single-Valued Dependencies -Single-Valued Normalization – 1NF, 2NF, 3NF, Boyce Codd Normal Form, Desirable Properties of Decomposition, Attribute Preservation, lossless-join Decomposition, Dependency Preservation, Lack of redundancy, Rules of Data Normalization, Eliminate Repeating Groups, Eliminate Redundant Data, Eliminate Columns Not Dependent on Key.

UNIT IV

The Structures Query Language – SQL; DDL, DML, DCL, Database Objects: Views, **Sequenc**es, Indexes and Synonyms, Views, Sequences, Indexes and Synonyms, Table Handling, Assertion and views, Cursors, triggers and stored procedures, Functions & Packages , Embedded SQL, dynamic SQL, SQLJ. **Transactions and Database Recovery -** The Transactions, The Concurrent Transactions,   The Locking Protocol, Serialisable Schedules, Locks, Two Phase Locking (2PL), Deadlock and its Prevention, Optimistic Concurrency Control , Recovery- Kinds of failures, Failure controlling methods, Database errors, Recovery Techniques, Security & Integrity, Relationship between Security and Integrity, Authorization   .

UNIT V

ENHANCED DATABASE   MODELS - Object Oriented Database- Limitations of Relational databases, The need of Object oriented databases, Complex Data Types, Structured Types and Inheritance in SQL, Object-Oriented versus Object-Relational; Database and XML- Structured Semi structure and unstructured data, XML hierarchical tree data model, Documents DTD and XML schema, XML Documents & Database, XML query and transformation, Storage of XML data, XML database applications

REFERENCES

- C. J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, Pearson Education, Eighth Edition, 2009.
- Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw-Hill Education (Asia), Fifth Edition, 2006.
- Shio Kumar Singh, Database Systems Concepts, Designs and Application, Pearson Education, Second Edition, 2011.
- Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management, Thomson Learning-Course Technology, Seventh Edition, 2007.
- Patrick O'Neil and Elizabeth O'Neil, Database Principles, Programming and Performance, Harcourt Asia Pte. Ltd., First Edition, 2001.
- Atul Kahate, Introduction to Database Management Systems, Pearson Education India, June 2004
- Introduction to Database Management Systems,by Atul Kahate, Publisher: Pearson Education India,Release Date: June 2004
- Distributed databases Principles and systems, Steffano Ceri, Giuseppe Pelagatti.TMH
- PostgreSQL Replication - 2nd Edition, Hans-Jürgen Schönig, July 2015
- Introduction to Object-Oriented Databases (Computer Systems Series) Won Kim

MCA204T DATA COMMUNICATION AND NETWORKS

UNIT I
Introduction to Data Communication: Components of Data Communication, Data representation, Transmission Impairments, Switching, Modulation, Multiplexing. Review of Network Hardware: LAN, MAN, WAN, Wireless networks, Internetworks. Review of Network Software: Layer, Protocols, Interfaces and services. Reference Models: OSI, TCP/IP and their comparison.

UNIT II
Physical Layer- Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (Radio, Microwave, Infrared). Introduction to ATM, ISDN, Cellular Radio and Communication Satellites. Data Link Layer - Services provided by DLL: FRAMING, ERROR CONTROL, FLOW CONTROL, MEDIUM ACCESS, Medium Access Sub layer; Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.

UNIT III
Network Layer Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding), Internetworking, IP Protocol, ARP, RARP. Network Trouble Shooting
Using Ping, Traceroute, IPconfig, Netstat, nslookup

UNIT IV
Transport Layer Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP). Application Layer – DNS—TELNET—FTP—SMTP—POP—SNMP—HTTP—IP over ATM—Mobile IP— Multimedia: audio and video compression—streaming stored audio/video—streaming live audio/video---real-time inter active audio/video—voice over IP—SIP—H.323—skype—virtual private network.

Public key and Secret key, DNS, Resource Records, Name Service, E-mail-Architecture and services, TELNET, File Transfer Protocol (FTP), Simple Network Management Protocol (SNMP), Simple Mail Transfer Protocol (SMTP) Hyper Text Transfer Protocol (HTTP), World Wide Web (WWW).

UNIT V
Cryptography: symmetric key cryptography—asymmetric key cryptography—security services: message confidentiality—message integrity—message authentication—entity authentication—digital signature key management—security in internet: IPSec—SSL/TLS—PGP—Firewalls. Introduction to MPLS—VPN—Traffic Engineering—RSVP(reservation protocol)— Tunneling—QoS.

REFERENCES:
1. Behrouz A. Forouzan,"Data Communications and Networking, The McGraw Hill Education Private Limited, New Delhi.
2. Behrouz A. Forouzan," TCP/IP protocol suite", The McGraw Hill edition, New Delhi.
3. "Data communication and computer networks", ISRD group, TMH publications.
4. Larry L.Peterson and Bruce S. Davie,"Computer networks-a system approach", Morgan Kaufmann publishers.
5. William Stalings, " Data and Computer communications", Pearson Education.
6. Andrew S Tanenbaum ,"Computer Networks", Prentice Hall.

MCA 205 T   WEB TECHNOLOGIES

UNIT 1

Introduction to web - connecting to internet, www, IP address, URL, DNS, Hosting.
Protocols governing the web - IP, TCP, HTTP, FTP, TELNET, *Web development strategies*-
Responsive design, Prototyping, Customization, *Web applications*-Architecture, Web
Application VS Distributed Application, *Web project*-Web Apps and Web Archives, *Web
team*-Roles and responsibilities.

UNIT II

Web Page Designing: *HTML*: HTML and SGML, DHTML, list, table, images, frames, forms
CSS: introduction, Creating style sheets, forms, color, classes, Layer tag, *XML:* features,
Structures in XML, DTD, XML schemes, presenting and using XML

UNIT III

Scripting: *Java script*: Introduction, documents, forms, statements, functions, objects; event
and event handling;
Introduction to AJAX- Requests, Response, Events
VB Script: Data types, User action, Functions, loops and conditions

UNIT IV

Server Side Programming:
Introduction to active server pages (ASP)-How does it work, procedures, ASP forms, cookies,
conditions, sessions, ASP.NET web pages, ASP.NET web forms, ASP.NET MVC model;
Java server pages (JSP)-JSP application design, tomcat server, JSP objects, declaring
variables, and methods, debugging, sharing data between JSP pages, Session, Application: data
base action, development of java beans in JSP
Introduction to COM/DCOM-Component Object Model, Interfaces, COM architecture,
DCOM, DCOM architecture, proxy and stub

UNIT V

The Ruby Language - OOP with Ruby - Text Processing and Scripting, Overview of Rails-
Document Requests- Processing Forms- Rails Application with Databases – Layouts. Ruby on
Rails Ajax.

REFERENCES
1. Xavier, C, " Web Technology and Design" , New Age International
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
3. Ramesh Bangia, "Internet and Web Design" , New Age International
4. Bhave, "Programming with Java", Pearson Education
5. Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education
6. Deitel, "Java for programmers", Pearson Educationeginning Rails: From Novice to
   Professional Paperback – Import, 16 Aug 2007, Cloves, Carneiro Jr, Hampton Catlin,
   Jeffrey Hardy.

MCA 206P DATA BASE MANAGEMENT SYSTEM

DBMS Practicals using MySQL.

Introduction to MySQL Database

Installation of MySQL

1. Table Design- Using foreign key and Normalization
2. Practice SQL Data Definition Language(DDL) commands
- Table creation and alteration(include integrity constraints such as primary key, referential integrity constraints, check, unique and null constraints both column and table level
- Other database objects such as view, index, cluster, sequence, synonym etc.
3. Practice SQL Data Manipulation Language (DML) commands
- Row insertion, deletion and updating
- Retrieval of data
- Simple select query
- Select with where options (include all relational and logical operators)
- Functions: Numeric, Data, Character, Conversion and Group functions with having clause.
- Set operators
- Sorting data
- Sub query (returning single row, multiple rows, more than one column, correlated sub query)
- Joining tables(single join, self join, outer join)
- Data manipulations using date functions
- User defined functions in a query
- Hints in queries to optimize performance
- Manage ODBC/JDBC connections
4. Practice Transaction Control Language (TCL) commands (Grant, revoke, commit and save point options)
5. Usage of triggers, functions and procedures using PL/SQL constructs
6. 10 PL/SQL Programs to be developed demonstrating PL/SQL Concepts

7. Development of a Databases using MySQL that could be used with one of the following application:

   i) Payroll Information

   ii) Student Information System

   iii) Library Information System etc.

8. Backup and restore databases;
9. Query optimization in a database

MCA207P   WEB TECHNOLOGIES PRACTICALS

Every student is expected to generate and develop a minimum of 30 programs (simple and complex) for the final evaluation and prepare a record of the same. All programs to be developed in Linux OS Environment.

Design an HTML form implementing different input types

Usage of internal and external CSS along with HTML pages

Create HTML page with layout

Create an image gallery using CSS

Use CSS to style an HTML form

Implementation of tree structure in XML

Implementing XML DTD

Java Script -Form validation including text field, radio buttons, checkboxes, list box and

                          other Controls

Date handling using java Script

JS event Handling -Creating event handler that respond to mouse and keyboard event:

Onload, onmouseover, onmouseout, onfocus, onblur, onsubmit, onresult, onclick,

Program to implement JS functions

Basic JSP programs

Sharing data between JSP pages

Using sessions and cookies as part of web applications (using JSP)

Sample web applications using JSP and MySQL

Introduction to Rails; Simple programs on Rails, Rails Application with Databases

MCA 301T   PRINCIPLES OF MANAGEMENT & ACCOUNTING

UNIT I

Basic Managerial Concepts, Levels of management, Managerial Skills, Concept of management Principles, nature and need of management, management functions, management thought – classical approach, scientific management, Fayol's management, bureaucratic approach, systems approach, Contingency approach. Planning – Meaning, nature, structure, steps, effective planning, MBO, SWOT Analysis. Organizing – meaning, process, structure, formal and informal, types of organization, departmentation, delegation of authority.

UNIT II

Staffing – meaning, nature, staffing process, recruitment & selection. Directing, supervision, Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y. Leadership, Communication – formal and informal, Oral and written, barriers, effective communication. Controlling-concepts, steps, objectives, features of a good control system.

UNIT III

Organizational behavior – Key elements, scope, models of OB, Individual behavior, personality, attitudes values and job satisfaction, Group behavior, team building- Types, process, roles.

UNIT IV

Marketing Management-importance, scope. Core Marketing Concepts, Marketing research, Customer value, Customer relationship management, Brand Equity, Product Life Cycle, Pricing Strategies, Distribution Channels, Promotions – Sales promotions, advertising and public relations. Marketing Information System, Global marketing and Integration.

UNIT V

Management Accounting- concepts, functions, role, Financial Accounting, Principles of accounting, accounting concepts, double entry system, journal entry, posting, trial balance, subsidiary books, final accounts. Depreciation – meaning, methods of depreciation.

References

1. Principles of Management, R N Gupta, S.Chand & Company Ltd.
2. Essentials of Management – Koontz & Wheinrich, 7th Edition, PHI Publications
3. Global marketing management, Keegan, 7th Edition, PHI Publications
4. Marketing management – Kotler, Keller, Jha and Koshy, 13th edition, Pearson Education
5. Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd
6. Organisational Behavior, S.S Khanka, S.Chand & Company Ltd
7. Principles of Management, L M Prasad, Sultan Chand Publications

MCA 302T ANALYSIS & DESIGN OF ALGORITHMS

UNIT I

Introduction – Algorithms-design strategies-concepts in performance analysis – space complexity, time complexity- asymptotic notation- practical complexities, performance measurement.

UNIT II

Divide and conquer method – General method, Finding the maximum and minimum, mergesort, Quick sort, Selection sort, Strassen's matrix multiplication.

UNIT III

Greedy Method and Dynamic programming method – The general method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree- prim's algorithm and kruskal's algorithm, optimal storage on tapes. Dynamic programming- General method, multistage graphs, All pairs shortest paths, The traveling salesperson problem.

UNIT IV

Backtracking and branch and bound techniques – The general method, The 8 queens problem, Sum of subsets. Branch and Bound- least cost search, control abstraction for LC search.

String Matching: Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.

UNIT V

Lower bound theory and NP Hard problem – Comparison trees- searching, sorting and selection. Concepts of NP hard and NP-complete problems, non deterministic algorithms ,Classes of NP hard and NP complete. COOK'S theorem.

REFERENCES

- Fundamentals of computer algorithms- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajeshekharan
- Fundamentals of algorithms – Gilles Brassard, Paul Bratley (PHI)
- Introduction to the design and analysis of algorithms – AnanyLevitin (Pearson)
- Computer algorithms – Introduction to design and analysis – Sara Baase, Allen VanGelder, (Pearson)
- Algorithm Design, Foundation, Analysis and Examples,Dr.Vijayakumar & Dr.Juby Mathew, Vimala Publications ,2016

MCA 303T   OBJECT ORIENTED PROGRAMMING THROUGH JAVA

UNIT I
Object Oriented Programming: Introduction to OOP's Paradigm, Characteristics of OOP's.
History and Basics of Java: Java's History and Creation, Java's Magic: Byte-code, Its Features, Architecture of Java Virtual Machine, Importance of Java for the Internet, JDK, Java Editors (notepad++, eclipse, netbeans, jbuilder, bluej) Java Program Structure and Java's Class Library, Java Data Types, Variables, and Operators, Operator Precedence. Scope of Variables, Control Structure. **Array and String:** Declaration and Definition, String Handling Using String Class and it functions and Wrapper classes.

UNIT II
Introduction Classes: Fundamental of Classes & Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, Variable **this**, Overloading Methods.
Extending Classes and Inheritance: Fundamental of Inheritance, Using Existing Classes, Polymorphism, Multiple Levels of Inheritance, Super keyword, super-class constructor, Abstraction through Abstract Classes, Using Final Modifier.
Packages & Interfaces: Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface, Multiple Inheritance through Interfaces.

UNIT III
Exception Handling: The concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Try and catch blocks, Try Defining Your Own Exceptions
Multithreading Programming: Understanding Threads, The Java Thread Model and life cycle of thread, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter-thread communication, Deadlocks.
Input/ Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

UNIT IV
Creating Applets in Java: Applet Basics, Applet Architecture, Applet Life Cycle, Simple Applet Display Methods, Requesting Repainting, Using The Status Window, The HTML APPLET Tag Passing Parameters to Applets.
Working with Windows Abstract Toolkit: AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, Displaying Information Within a Window.

UNIT V
Working with Graphics, Controls and Text : Working with Graphics, Working with Color, Setting the Paint Mode, Working with Fonts, Managing Text Output Using Font Metrics, Exploring Text and **Controls:** Introduction, Adding and Removing Controls, Responding to Controls such that Label, Buttons, Checkboxes, Choice, Lists, Scroll Bar, Text Field, Text Area.
Graphics: Working with AWT Controls, Layout Managers and Menus.

REFERENCES:

1. Object Oriented Programming With Java, Balagurusami
2. The Complete Reference JAVA by Herbert Schildt, TMH Publication.
3. Beginning JAVA, Ivor Horton, WROX Public.
4. JAVA 2 UNLEASHED, Tech Media Publications.
5. JAVA 2(1.3) API Documentations

MCA 304T SOFTWARE ENGINEERING & PROJECT MANAGEMENT

UNIT I

Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice. Process Models: A Generic Process Model, Process Assessment and Improvement, Perspective Process Models, Specialized Process Models.

UNIT II

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Validating Requirements. Requirements Modeling: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class – Based Modeling. Software Engineering Project Management: Major issues of Software Engineering, Functions and activities of Management, planning, organizing, staffing, directing and controlling a software Engineering Project. Project Evaluation: Strategic Assessment, technical assessment, Cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, Risk evaluation.

UNIT III

Selection of an appropriate project approach: Choosing Technologies, technical plan contents list,choice of process models, structure versus speed of delivery, The Waterfall model, The V-process model, the spiral model, Software prototyping, other ways of categorizing software prototypes. Controlling changes during prototyping, incremental delivery, dynamic systems development method, Extreme programming Managing iterative processes, selecting the most appropriate process model

UNIT IV

Software Effort Estimation: Problems with over and under estimates. The basis for Software estimating, Software effort estimation techniques, expert judgment, estimating by analogy, Albrecht function point analysis, function points Mark II, Object points, a procedural code –oriented approach, COCOMO: A Parametric Model.

UNIT V

Activity planning: The objectives of activity planning, When to plan, Project Schedules, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, Risk Management: The nature of risk, types of risks, Managing Risk, Hazard Identification, Hazard Analysis, Risk planning and control, Evaluating risks to the schedule.

REFERENCES

- Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, 2010.
- Richard Fairey, 'Software Engineering concepts, Tata McGraw-Hill 2009 reprint
- Software Project Management by Bob Hughes and Mike Cotterell, Tata McGraw-Hill Edition 2004.
- Software Project Management- A unified framework by Walker Royce, Pearson Education, 2003.
- Software Engineering-a Practitioner's approach by Roger S Pressman, Sixth Edition, Tata McGraw Hill.
- Software Management By Donald J Reifer, Sixth Edition, Wiley-IEEE Computer Society Press, 2002.

MCA 305T   OBJECT ORIENTED ANALYSIS & DESIGN

UNIT-I

AN OVERVIEW OF OBJECT ORIENTED SYSTEMS DEVELOPMENT: Introduction, Two Orthogonal Views of the Software, Object Oriented Systems Development Methodology, Why an Object Orientation? WHY WE MODEL: The Importance of Modeling, Principles of Modeling, Object Oriented Modeling

INTRODUCING THE UML: An overview of the UML, A Conceptual Model of the UML, Architecture, Software Development Life Cycle

UNIT-II

BASIC STRUCTURAL MODELING: Classes, Relationships, Common Mechanisms, and diagrams, class diagrams ADVANCED STRUCTURAL MODELING: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Object Diagrams

UNIT-III

BASIC BEHAVIORAL MODELING: Interactions, Interaction diagrams, Use cases, Use case diagrams, Activity Diagrams ADVANCED BEHAVIORAL MODELING: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-IV (11 Lectures)

ARCHITECTURAL MODELING I: Component, Deployment, Component diagrams and Deployment diagrams ARCHITECTURAL MODELING II: Patterns and Frameworks, Collaborations, Systems and Models.

UNIT-V

CASE STUDY: Bank ATM Application, Railway Reservation System.

REFERENCES:

- Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007.
- Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.
- Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", 1stEdition, Pearson Education, 2006.
- Pascal Roques, "Modeling Software Systems Using UML2", 1stEdition, WILEY Dreamtech, 2007.
- Atul Kahate, "Object Oriented Analysis & Design", 1stEdition, TMH, 2007.
- Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, TMH, 2005.
- Craig Larman, "Appling UML and Patterns: An introduction to Object", Oriented Analysis and Design and Unified Process, 3rd Edition, Pearson Education, 2007.

MCA 306P PHP PROGRAMMING PRACTICALS

Installing PHP, creating and working with variables, constants, PHPs Internal Data Types;

Math Operators, Assignment Operators, String Operators, Bitwise Operators, Comparison Operators, Logical Operators;

Using the IF Statement, else Statement, elseif, ternary operator, switch statement, while loops, do..while loops, foreach loop;

String functions, formatting text strings, arrays, handling arrays with Loops

Sorting Arrays; Array Operators; Multidimensional Arrays;

Functions in PHP, passing arrays to functions, passing by reference, returning arrays, introducing variable scope in PHP, Conditional Functions, Nesting functions, Variable Functions;

Setting Webpages to communicate with PHP; Handling text fields, text areas, check boxes, radio buttons, list boxes, password controls, image maps, buttons, File uploads;

PHP server variables, HTTP Headers

Obect oriented Programming – creating classes, objects, setting access, Constructors, Inheritance, Overloading, Autoloading Classes

Static Methods, Creating Abstract Classes, Interfaces, FINAL Keyword;

File handling – fopen, feof, fgets, closing a file, fgetc, f_get_contents, file_exists, filesize, fread, fscanf, fseek, copying files, fwrite, reading and writing binary files, appending to files

Working with Database – MySQL Database, Connecting to the database server and database, displaying the table data, updating databases, inserting new data into database, creating new tables, deleting records, sorting the data.

Sessions and cookies – Setting a cookie, reading a cookie, working with ftp, downloading files with ftp, uploading and deleting files with ftp, sending email, writing a hit counter using sessions;

Implement the above concepts using 50 programs in the Lab Cycle and a small project connecting a website developed in PHP with a database created using MySQL.

References:

- The complete reference PHP, McGraw Hill Education, Holzner;
- PHP Programming, Penn Wu,
- Object oriented PHP, Peter Lavin
- Modern PHP, Josh Lockhart

MCA307P OOPS THROUGH JAVA PRACTICALS

All students are expected to develop 50 Programs (simple and complex) which will demonstrate the theoretical concepts studied in the Java Theory paper of MCA.

- Programs to illustrate class, objects and constructors
- Programs to implement overloading, overriding, polymorphism etc
- Programs to implement the usage of packages
- Programs to create our own exception
- Programs for handling file operation
- Implement the concept of thread Programming
- Programs to implement Generic class and generic methods
- Applet Programs for passing parameters
- Applet Programs for running an audio file
- Programs for event-driven paradigm in Java
- Event driven Programs for Graphical Drawing Application
- Programs that uses Menu driven Application
- Programs to implement JDBC in GUI and Console Application
- Web page design using HTML and client side validation using Java-script
- Programs to implement session Handling and Cookies in Servlets and JSP
- Socket Programming to implement communications
- Develop a multi-threaded GUI application of your choice.

MCA 401T   SYSTEM SOFTWARE

UNIT I
FINITE AUTOMATA- Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA &NDFA – Regular languages- Regular Expression – Equivalence of NFA and DFA – – Equivalence of finite Automaton and regular expressions –Minimization of DFA- – Pumping Lemma for Regular sets. Grammar- Types of Grammar – Context Free Grammars and Languages– Derivations and Languages.
Turing Machines - Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines

UNIT II
INTRODUCTION - System software and machine architecture - The Simplified Instructional Computer (SIC) Machine architecture - Data and instruction formats - addressing modes - Instruction sets - I/O and programming.

UNIT III
ASSEMBLERS - Basic assembler functions- A simple SIC assembler –Assembler algorithm and data structures -Machine dependent assembler features -Instruction formats and addressing modes –Program relocation -Machine independent assembler features -Literals –Symbol-defining statements –Expressions -One pass assemblers and Multi pass assemblers -Implementation example -MASM assembler.

UNIT IV
LOADERS AND LINKERS- Basic loader functions-Design of an Absolute Loader –A Simple Bootstrap Loader -Machine dependent loader features -Relocation –Program Linking –Algorithm and Data Structures for Linking Loader -Machine-independent loader features - Automatic Library Search –Loader Options -Loader design options -Linkage editors –Dynamic Linking –Bootstrap Loaders -Implementation example- MSDOS linker.

UNIT V
MACRO PROCESSORS- Basic macro processor functions -Macro Definition and Expansion – Macro Processor Algorithm and data structures -Machine-independent macro processor features - Concatenation of Macro Parameters –Generation of Unique Labels –Conditional Macro Expansion –Keyword Macro Parameters-Macro within Macro.

SYSTEM SOFTWARE TOOLS- Text editors -Overview of the Editing Process -User Interface – Editor Structure. -Interactive debugging systems-Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria

REFERENCES
- Leland L. Beck, "System Software – An Introduction to Systems Programming", Pearson Education Asia.
- D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill.
- John J. Donovan "Systems Programming", Tata McGraw - Hill Edition.
- Mishra K L P and Chandrasekaran N, "Theory of Computer Science – Automata, Languages and Computation", Third Edition, Prentice Hall of India
- Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi.
- Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi.

MCA 402T DATA MINING

UNIT I
Introduction to Data mining & Date Warehouse
What is Data mining, Data mining -On What kinds of Data, Data mining Functionalities, Classification of Data mining Systems, Data Mining Task Primitives, Integration of Data mining systems, Major issues of Data mining, What is Data Warehouse, Multidimensional Data Model, A three-tier Data Warehousing Architecture.

UNIT II
Data Preprocessing and Mining Frequent Patterns
Data Preprocessing; Data Cleaning, Data Integration and Transformation, Data Reduction, Data discretization and concept hierarchy generation.
Association Rules
Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods **:** Apriori Algorithm, Generating association Rules from Frequent Item sets, improving the Efficiency of Apriori. Mining Frequent item-sets without Candidate Generation.

UNIT III
Classification and Prediction
Introduction to Classification and Prediction, Issues Regarding Classification and Prediction
Classification by Decision Tree Induction: Decision Tree induction, Attribute Selection Measures,Tree Pruning, **Bayesian Classification**: Bayes' theorem, Naïve Bayesian Classification, **Rule Based Algorithms**: Using If - Then rules of Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering algorithm, **K- Nearest Neighbour Classifiers.**
Prediction : Linear Regression, Nonlinear Regression, Other Regression-Based Methods

UNIT IV
Clustering
What is Cluster Analysis, Requirements of Cluster Analysis' Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, **Partitioning Methods** :k-Means and k- Medoids, From KMedoids to CLARANS , **Hierarchical Method** : Agglomerative and Divisive Hierarchical Clustering, BIRCH, ROCK, Chameleon, **Density–Based Method**: DBSCAN, **Grid Based Methods:** STING: STatistical INformation Grid, Wave Cluster, **Model based Methods-**Expectation-Maximization, Conceptual Clustering, Neural Network Approach.

UNIT V
Applications and Trends in Data Mining
Data Mining Applications : Data Mining for Financial Data Analysis, Data Mining for the Retail Industry, Data Mining for the Telecommunication Industry, Data Mining for Biological Data Analysis, Data Mining in Other Scientific Applications, Data Mining for Intrusion Detection, Social Impacts of Data Mining, Trends in Data Mining.

References
- Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
- Data Mining – BPB Editorial Board, BPB Publications, First Edition, 2004
- Data Warehousing, Data Mining, & OLAP – Alex Berson, Stephen Smith, TMHill,2004
- Data Warehousing, Sinha, Thomson Learning

MCA 403T   TCP/IP Protocols

UNIT I

Introduction, Arpanet, TCP/IP Protocol, Protocols and Standards, Internet Administration, Protocol Layers, OSI Model, TCP/IP Model, Addressing; Wired LAN, Wireless LAN, Point – to point WAN, Switched WAN; Network Layer – Switching, Connection Oriented and Connection Less Service, Network Layer Services, Error Control, Flow Control, Congestion Control, QoS;

UNIT II

Addressing, Classful Addressing, Classless Addressing, Special Addresses, NAT; Delivery of Packets, Forwarding based on Destination Address, Forwarding based on Labels, Structure of a router; ARP- Address Mapping, The ARP Protocol, ATMARP, ARP Package; ICMP – Messages, Debugging Tools, ICMP Package;

Mobile IP- Addressing, Agents, Three Phases, Inefficiency in Mobile IP;

UNIT III

Unicasting, Intra and Inter Domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP; Multicasting – Introduction, Multicast Addresses, IGMP, Multicast routing, Routing Protocols – Multicast Link State Routing, Multicast Distance Vector,DVMRP, CBT, PIM; Transport Layer Services; Transport layer protocols, UDP, UDP Services, UDP Applications

UNIT IV

TCP Services, Segment, State Transition Diagrams, flow Control, Error Control, Congestion Control; Client Server paradigm, Peer to Peer paradigm; DNS, DNS Resolution, Messages, Types of records;

UNIT V

TELNET, SSH, FTP, TFTP, HTTP, SMTP; IPv6 Addressing, IPv6 Protocols;

REFERENCES

- TCP/IP Protocol Suite, FOROUZAN, McGraw Hill International Edition;
- TCP/IP Illustrated: The Protocols, Fall & Stevens;
- TCP/IP, The Ultimate Protocol Guide, Universal Publishers;
- TCP/IP foundations, Andrew Blank, Wiley Publishers

MCA 404T LINUX OS AND SHELL PROGRAMMING

UNIT I

Introduction to Linux - History, Architecture, Comparison with UNIX, Features and Facilities of Linux, Basic commands in Linux, Files and File Structure - Linux File System, Boot block, Super block, Inode table, Data blocks, Linux standard directories. File naming Conventions, Path, Types of file names and Users, File Commands in Linux, file comparisons, Directory Commands, Text Editors-Functions of a Text Editor, vi Editor, Locating Files, File Access Permissions [FAP], Viewing and Changing FAPs, Redirection, Filters, Pipes.

UNIT II

Basics of shell programming, various types of shell available in Linux, comparisons between various shells, shell programming in bash - Conditional and looping statements, Iterations, Command Substitution - expr command, arithmetic expansion, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automating system tasks.

UNIT III

Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of users accounts, creating and mounting file system.

UNIT IV

Checking and monitoring system performance - file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes,users, kernel. Installing and removing packages. Backup, restore and Compress utilities - tar, cpio, dump,rsync and restore utilities.

UNIT V

Communication in Linux - mesg, who- T, talk, write, wall, finger, chfn, ping, traceroute utilities, email facilities . Configuration of servers- Telnet, FTP, DHCP,NFS, SSH, Proxy Server(Squid), Web server (Apache), Samba. Daemons- init, crond, atd, xinetd, inetd, the services file. named, sshd, httpd.

REFERENCES

- Operating System - Linux, NIIT Press, PHI Publisher, 2006 Edition
- Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
- UNIX Shell Programming by Yeswant Kanetkar, BPB
- Linux Administration Handbook, Evi Nemeth, Garth Snyder, Trent KHein –Pearson Education.
- Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech

MCA 405E ELECTIVE I

LIST OF ELECTIVES FOR SEMESTER 4

1.   **E41 – MICROPROCESSORS AND EMBEDDED SYSTEMS**

2.   **E42 – BIG DATA ANALYTICS**

3.   **E43 – CLOUD AND GRID COMPUTING**

4.   **E44 – SOCIAL NETWORK ANALYSIS**

5.   **E45 – CRYPTOGRAPHY AND COMPUTER SECURITY**

6.   **E46 – SOFT COMPUTING**

Every Student is supposed to take one elective paper in Semester 4 as part of the MCA course. Examinations will be conducted for the selected paper by the University with both internal and external components like other core papers.

MCA 405 E41 - MICROPROCESSORS AND EMBEDDED SYSTEMS

UNIT I

The Processors : 8086 - Register Organization of 8086, Architecture, Signal Description of 8086, Physical Memory Organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum Mode 8086 System and Timings, Maximum Mode 8086 System and Timings. Addressing Modes of 8086.

UNIT II

Instruction Set, Assembler Directives and Assembly Language Programming of 8086 - Machine Language Instruction Formats – Instruction Set of 8086-Data transfer instructions, Arithmetic and Logic instructions, Branch instructions, Loop instructions, Processor Control instructions, Flag Manipulation instructions, Shift and Rotate instructions ,String instructions, Assembler Directives and operators, Example Programs**,** Introduction to Stack, STACK Structure of 8086, Interrupts and Interrupt Service Routines, Interrupt Cycle of 8086, Non-Maskable and Maskable Interrupts, Interrupt Programming, MACROS.

UNIT III

Special Purpose Programmable Devices and their Interfacing **-** Data transfer schemes-programmed I/O, Interrupt I/O, DMA, DMA Controller 8257, Programmable Interval Timer 8253, Programmable Interrupt Controller 8259A, Programmable Communication Interface 8251 USART, Programmable Peripheral Interface 8255.

UNIT IV

Architecture and Comparison of various Processors **-** 80186, 80286, 80386, 80486, Pentium Processors, Case Study on Advanced Multiprocessors

UNIT V

Introduction to Embedded Systems **.**

Embedded system – classification, Hardware Components of an Embedded system.
Microcontrollers 8051 – Introduction, Architecture, Memory Organization, Instruction Set – Programming.

References

- Advanced Microprocessors and Peripherals – Architecture, Programming and Interfacing by   A.K. Ray and K.M. Bhurchand, Tata McGraw Hill,2002 Edition
- Embedded Systems – Architecture, Programming & Design by Raj Kamal -Tata McGraw Hill.
- The Intel Microprocessors 8086/8088, 80816/80188, 80286, 80486 Pentium and Pentium Pro Processor – Architecture, Programming and interfacing by Brey, 4th Edition, PHI.
- Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, 2nd Edition, Tata McGraw Hill, 2002.
- Microprocessor x86 Programming by K.R. Venugopal and Raj Kumar – BPB publications
- Micro Controllers – [Theory And Applications] by Ajay V. Deshmukh- Tata McGraw Hill.

MCA 405 E42 - BIG DATA ANALYTICS

UNIT I
UNDERSTANDING BIG DATA - What is big data; why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics .

UNIT II
NOSQL DATA MANAGEMENT - Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – mapreduce – partitioning and combining – composing map-reduce calculations.

UNIT III
BASICS OF HADOOP - Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

UNIT IV
MAPREDUCE APPLICATIONS- MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT V
HADOOP RELATED TOOLS 9 Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

REFERENCES
- Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
- P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
- Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
- Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
- E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
- Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
- Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
- Alan Gates, "Programming Pig", O'Reilley, 2011.

MCA 405 E43 - CLOUD AND GRID COMPUTING

UNIT I

Cloud Computing Basics-Overview, Applications, Intranets and the Cloud, Hardware and Infrastructure-Clients, Security, Network, Services. Software as a Service (Saas)- Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS), Benefits of Paas Solutions, Disadvantages of Paas Solutions. Infrastructure as a Service (Iaas)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types. Identity as a Service (IDaaS)- Understanding Single Sign-On (SSO), OpenID, Mobile ID Management. Cloud Storage-Overview, Cloud Storage Providers.

UNIT II

Virtualization-Understanding Virtualization, History, Leveraging Blade Servers, Server Virtualization, Data Storage Virtualization. Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.

UNIT III

Service Oriented Architecture-Understanding SOA, Web Services Are Not Web Pages, Understanding Web Service Performance, Reuse and Interoperability. Developing Applications-Google, Microsoft, Cast Iron Cloud, Bungee Connect, Development. Migrating to the Cloud-Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, and Migration. Designing Cloud Based Solutions-System Requirements, Design Is a Give-and-Take Process. Coding Cloud Based Applications-Creating a Simple Yahoo Pipe, Using Google App Engine and creating a Windows Azure Application.

UNIT IV

Grid Computing: Introduction - Definition -Scope of grid computing. Grid computing model - Grid.Protocols – Desktop grids: Characteristics – key elements – Role in enterprise computing infrastructure. Data grids: Avaki Data Grid – Data grid Architecture. Grid Computing Initiatives: Grid Computing Organizations and their roles – Grid Computing anatomy – Grid Computing road map. Grid Computing Applications: Merging the Grid services architecture with the Web Services Architecture.

UNIT V

Technologies: OGSA – Sample use cases – OGSA platform components – OGSI – OGSA Basic Services. Managing Grid Environments: Managing grids – management reporting – monitoring – service level management – data catalogs and replica management.

REFERENCES

- Joshy Joseph & Craig Fellenstein, "Grid Computing", PHI, PTR-2003.
- Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", Charles, River media – 2003.
- Fran Bermn, Geoffrey Fox, Anthony Hey J.G., "Grid Computing: Making the Global Infrastructure a Reality", Wiley, USA, 2003
- Maozhen Li, Mark Baker, "The Grid: Core Technologies", John Wiley & Sons, 2005.
- Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010, The McGraw-Hill.
  - Cloud Computing Bible by Barrie Sosinsky, Published by Wiley Publishing, 2011.

MCA 405 E44 - SOCIAL NETWORK ANALYSIS

UNIT I INTRODUCTION
Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS
Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks – Multi – Relational characterization of dynamic social network communities.

UNIT IV - PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES
Understanding and predicting human behaviour for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and countermeasures.

UNIT V -VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare –Collaboration networks – Co-Citation networks.

REFERENCE BOOKS

- Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
- Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
- Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
- John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

MCA 405 E45 – CRYPTOGRAPHY AND COMPUTER SECURITY

UNIT I

Foundations of Cryptography and Security – Ciphers and Secret Messages, Security Attacks and Services, Mathematical Tools for Cryptography, Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms, Conventional Symmetric Encryption Algorithms, Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Strength of DES.

UNIT II

Modern Symmetric Encryption Algorithms, IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution, Stream Ciphers and Pseudo Random Numbers, Pseudo Random Sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad.

UNIT III

Public Key Cryptography – Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Excahnge Algorithms, Public-Key Cryptography Standards

UNIT IV

Hashes and Message Digests – Message Authentication, MD5, SHA, RIPEMD, HMAC, Digital Signatures, Certificates, User Authentication, Digital Signature Standard, Security Handshake Pitfalls, Elliptic Curve Cryptosystems.

UNIT V

Authentication of Systems, Kerberos, Electronic Mail Security, Pretty Good Privacy, IP and Web Security, Secure Sockets and Transport Layer, Electronic Commerce Security, electronic Payment Systems, Secure Electronic Transaction, Digital Watermarking.

REFERENCES

- Behrouz A Forouzan, Cryptography and Network Security, Tata Mc Graw Hill, 2005
- William Stalings, Cryptography and Network Security, Principles and Practices. 6th, Edition, Pearson Education, 2005.
- Menezes, Network Security and Cryptography, Cengage Learning

MCA 405 E46 - SOFT COMPUTING

UNIT I

Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic Fuzzy Set Operations, Properties of Fuzzy Sets ,Fuzzy Relations – Operations on Fuzzy Relations , Properties, Membership Functions, Fuzzification, Defuzzification Methods. Fuzzy If-Then Rules, Fuzzy Reasoning , Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models.

UNIT II

Artificial Neuron, Activation Functions, Training an Artificial Neural Net work- Supervised, Unsupervised, Reinforsed Training, Single and multi layer networks, Basic learning laws, Perceptron convergence, Back Propogation Network, Associative memory, Competitive Learning, Self organizing neural networks- Kohonen self organizing Maps

UNIT III

Difference between Traditional Algorithms and GA, The basic concepts, creation of offspring, working principles, Encoding , Fitness function, Reproduction , Cross Over, Mutation, Convergence Theory, Applications.

UNIT IV

Evolutionary Computing, Simulated Annealing, Particle Swarm optimization, Real to Artificial Ants, Ant colony optimization, Ant Colony Optimization Algorithms for the Traveling Salesman Problem

UNIT V

Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

REFERENCES

- Neuro-Fuzzy and Soft Computing, Jang, Sun, & Mizutani, PHI.
- S. N. Sivanandan and S. N. Deepa , Principles of Soft Computing , Wiley India 2 nd Ed, 2011.
- S. Rajasekaran & GA Vijayalakshmi Pai "Neural Networks, Fuzzy Logic, and Genetic Algorithms synthesis and application", PHI
- S.N.Sivanandam · S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.
- Neural Networks, S. Haykin, Pearson Education, 2ed, 2001.
- James F. Kennedy, Russell C. Eberhart, Swarm intelligence, Morgan Kaufman, 2001
- Introduction To Evolutionary Computing, A.E.Eiben, J.E.Smith, Springer 2003.

<u>MCA 406P   LINUX OS & SHELL PROGRAMMING PRACTICALS</u>

Develop Programs to demonstrate the following concepts

Installation of Linux, network based installation,

Basic Overview of various commands- cal, pwd, cd, ls, mv, cd, cp, rm, mkdir, rmdir, more, less, touch.

Creating and viewing files using cat, file comparisons, disk related commands, checking disk free spaces.

Batch commands, kill, ps, who, Printing commands, find, sort, touch, file, file processing commands- wc, cut, paste etc . mathematical commands - expr, factor etc.

Filter commands- pr, head, tail, cut, sort, uniq, tr - Filter using regular expression grep, egrep, sed, awk.

Shell Programming -Shells, Scripting Rationale Creating a bash Script, bash Start up Files, A Script's Environment, Exporting Variables, Exit Status, Programming the Shell, Parameter Passing, Operators, looping, Input and Output.

Process Management with Linux, File System management, User Administration, Linux Start up and Shutdown, Software package Management

Network Administration LAN Card configuration, Server Configuration- DHCP, DNS, FTP, Telnet, SSH, NFS, WebServer, SQUID Proxy server.

References

- Operating System - Linux, NUT Press, PHI Publisher, 2006 Edition
- Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
- UNIX Shell Programming by YeswantKanetkar, BPB
- Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein –Pearson education.
- Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India

MCA407D   MINI PROJECT – APPLICATION DEVELOPMENT

The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research.

The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. Any computer science project usually consists of the following: **analysis, design, coding/implementation and testing** of some information system or subsystem, such as, a piece of software. In this course we expect a software system or subsystem.

This course will also develop your investigative, research and report writing skills and will provide an opportunity for you, to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to complex computing problems.

Project Team

The project team should be organized and determined towards the fulfilment of their projects' objectives and tasks. A maximum of two students should work on a project, however, an individual student can also undertake the project on his/her own.

The main responsibilities of the project team/student are to:

   • Ensure that an appropriate amount of time and effort is applied to the project,

   • Ensure that they are responsive to the guidance of their counsellor,

   • Acknowledge the text, material and ideas of others properly,

   • Meet all milestones and regulations related to the work, and

   • To communicate any problems that are likely to prejudice the quality or time lines of the work to the counsellor as and when such problems arise.

Project Categories

Four broad areas / categories of computer science are given below, so that you can select any of these category for your Mini project.

• Application development

• Networking project

• System software

 • Website development.

MCA 501T   USER INTERFACE DESIGN

UNIT I   Introduction
Introduction-Importance-Human-Computer interface-characteristics of graphical and web user interface-advantages and disadvantages of graphical systems-characteristics of GUI - web user interface- popularity-characteristics of Web interface-internet-intranet-extranet-principles of UID

UNIT II   Human Computer Interaction
User interface design process- obstacles-usability-Creating graphical systems-Know your user client-human characteristics in design-Understand the business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system trainings– Understand the principles of good screen design-Human consideration in screen design- Develop System Menus and Navigation Schemes-structures of menus - functions of menus- contents of menu-formatting - phrasing the menu - selecting menu choice-navigating menus- graphical menus.

UNIT III   Windows
Windows: Characteristics-   components-   presentation   styles-types-managements Organizations- Operations-web systems-device-based controls: characteristics-Screen-based Controls: operate control-text boxes-selection control-combination control-custom control presentation Control.

UNIT IV -   Multimedia
Write clear text and messages-Text for web pages - effective feedback-guidance & assistance- Internationalization accessibility-Icons-Image - Multimedia -coloring.

UNIT V   Windows Layout - Test
Windows layout-test: prototypes - kinds of tests - retest - Information search - Visualization - Hypermedia - www - Software tools.

References
1. Wilbent. O. Galitz ,"The Essential Guide to User Interface Design", John Wiley& Sons,
   2001.
2. Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.
3. Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd.,
   2002.

MCA 502T KNOWLEDGE MANAGEMENT AND BUSINESS INTELLIGENCE

UNIT - I
Basics - What is Knowledge Management? - Key Challenges - KM Life Cycle - Understanding Knowledge – Definitions - Cognition and Knowledge Management - Data, Information, and Knowledge - Types of Knowledge - Expert Knowledge.

UNIT - II
Knowledge Management System Life Cycle - Challenges in Building KM Systems - Conventional Versus KM System Life Cycle - KM System Life Cycle - System Justification - Role of Rapid Prototyping - Role of Knowledge Developer – User Training.

UNIT - III
Knowledge Creation - Nonaka's Model of Knowledge Creation and Transformation - Knowledge Architecture - Capturing Tacit Knowledge – Evaluating the Expert – Developing a relationship with Expert – Interview as a tool – Brainstorming – Repertory Grid - NominalGroup Techniques(NGT) – Delphi method – Concept mapping Knowledge Codification - Codification Tools and Procedures - Knowledge Developers Skill Set - Knowledge Transfer - Transfer Methods - Portals Basics - Business Challenge - Knowledge Portal Technologies - Ethical and Legal Issues - Knowledge Owners - Legal Issues.

UNIT - IV
Changing Business Environments and Computerized Decision Support - A Framework for Business Intelligence - Intelligence Creation and Use and BI Governance - Transaction Processing versus Analytic Processing - Successful BI Implementation - Major Tools and Techniques of Business Intelligence.

UNIT - V
Implementing BI: An Overview - BI and Integration Implementation - Connecting BI Systems to Databases and Other Enterprise Systems - On-Demand BI - Issues of Legality, Privacy, and Ethics - Emerging Topics in BI: An Overview - The Web 2.0 Revolution - Online Social Networking: Basics and Examples - Virtual Worlds - Social Networks and BI: Collaborative Decision Making - RFID and New BI Application Opportunities - Reality Mining.

REFERENCES:
1. Elias M.Awad, Hassan M.Ghaziri,"Knowledge Management", Pearson Education, 2004, (For Units I, II and III).
2. Efraim Turban, Ramesh Sharda, Dursun Delen and David King, "Business Intelligence" 2 nd Edition, 2010. (For Unit IV – Chapter 1, Unit – V -Chapter 6)03

MCA 503T ENTERPRISE RESOURCE PLANNING

MODULE I

INTRODUCTION - Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.

MODULE II

ERP SOLUTIONS AND FUNCTIONAL MODULES - Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

MODULE III

ERP IMPLEMENTATION - Planning Evaluation and selection of ERP systems - Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration. People Organization in implementation-Consultants, Vendors and Employees.

MODULE IV

POST IMPLEMENTATION - Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.

MODULE V

EMERGING TRENDS ON ERP - Extended ERP systems and ERP add-ons -CRM, SCM, Business analytics - Future trends in ERP systems-web enabled, Wireless technologies, cloud computing.

Case studies on ERP Systems used in Industries/Organizations

REFERENCES

1. Sinha P. Magal and Jeffery Word, Essentials of Business Process and Information System, Wiley India, 2012

2. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008

3. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.

4. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009

5. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India, 2006.

6. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2008.

MCA504T   ADVANCED JAVA PROGRAMMING

UNIT I - JAVA FUNDAMENTALS

Java I/O streaming – filter and pipe streams – Byte Code interpretation - Threading – Swing.

UNIT II NETWORK PROGRAMMING IN JAVA

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services

UNIT III APPLICATIONS IN DISTRIBUTED ENVIRONMENT

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation

UNIT IV MULTI-TIER APPLICATION DEVELOPMENT

Server side programming – servlets – Java Server Pages - Applet to Applet communication – applet to Servlet communication - JDBC – Applications on databases – Multimedia streaming applications – Java Media Framework.

UNIT V ENTERPRISE APPLICATIONS

Server Side Component Architecture – Introduction to J2EE – Session Beans – Entity Beans – Persistent Entity Beans.

REFERENCES:

- Elliotte Rusty Harold, " Java Network Programming", O'Reilly publishers, 2000 (UNIT II)
- Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999. (UNIT III and UNIT V)
- Hortsmann & Cornell, "CORE JAVA vol. 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002. (UNIT I and UNIT IV)
- Web reference: http://java.sun.com. 2. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill, 2003.

MCA 505E ELECTIVE II

LIST OF ELECTIVES FOR SEMESTER 5

1.   **E51 – ADHOC AND SENSOR NETWORKS**

2.   **E52 – MULTIMEDIA SYSTEMS**

3.   **E53 – INFORMATION SECURITY AND E-COMMERCE**

4.   **E54 – DIGITAL IMAGE PROCESSING**

5.   **E55 – DISTRIBUTED COMPUTING**

6.   **E56 – COMPUTER GRAPHICS WITH OPENGL**

Every Student is supposed to take one elective paper in Semester 5 as part of the MCA course. Examinations will be conducted for the selected paper by the University with both internal and external components like other core papers.

MCA 505 E51 - ADHOC AND SENSOR NETWORKS

UNIT - 1

Fundamentals of Wireless Communication Technology –Routing in Ad Hoc Networks, Broadcasting, Multicasting and Geocasting-mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.. Routing in Wireless Networks: proactive routing, reactive routing (on demand), hybrid routing, power-aware routing, Agent-based routing, random walk, trace routing

UNIT - II

TCP over mobile ad hoc networks: IP address acquisition, effects of partitions on TCP, provisions for mobility and fairness. Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11,Network simulators

UNIT -III

Issues in designing a routing and Transport Layer protocol for Ad hoc networks-. Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.. WSN Clock Synchronization: clustering for synchronization, sender-receiver and receiver-receiver synchronization. Error analysis. WSN Node Localization: absolute and relative localization, triangulation, multi-hop localization and error analysis, anchoring, geographic localization.

UNIT - IV

Hybrid wireless networks and wireless sensor networks: Architectures and routing protocols for hybrid wireless networks; Load balancing schemes; Pricing schemes for multihop wireless Networks, Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4

UNIT - V

Recent advances in wireless networks Wide Band (UWB) communication; Issues and challenges in UWB communication; Applications of UWB communication; Wireless Fidelity (Wi-Fi) systems; Issues in Wi-Fi Systems; Pricing/billing in Wi-Fi systems; Multimode 802.11; Optical wireless communications; Optical Wireless Wavelength Division Multiplexing (OWWDM). Security in Ad Hoc and Sensor Networks, Integrating MANETs, WLANs and Cellular Networks

References
- Carlos de MoraisCordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks : Theory and Applications", Second Edition, World Scientific Publishers, 2011
- PrasantMohapatra and Sriramamurtyhy, "Ad Hoc Networks: Technologies and Protocols",Springer International Edition, 2009
- KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks', A John Wiley & Sons Inc. Publication, 2007
- C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

MCA 505 E52 - MULTIMEDIA SYSTEMS

UNIT I

Introduction, Characteristics, Hardware and Software Requirements, Applications of Multimedia. **Media and data Streams**-Medium, Properties of Multimedia System, Traditional Data Streams, Continuous Data Stream.

UNIT 2

Text-Types, Font, Compression,File Formats. **Sound** - Basic Concepts, Representation, Audio Formats.Music: MIDI, MIDI Devices, MIDI Software Speech:Generation,Analysis, Transmission. **Animation**: Introduction, Key frames,Tweening,File Formats, Types. **Video:** Concepts and Formats

UNIT 3

Image & Graphics: Concepts, Image processing. **Data Compression:** Compression Algorithms : Need for compression, Lossless compression algorithms: Run-Length Encoding, Pattern Substitution, Entropy Encoding; Huffman Coding; Arithmetic Coding; Simple Arithmetic Coding, Lossy compression algorithms – DCT, Wavelet –based coding , JPEG – Image preparation, MPEG – Video/ Audio Encoding, MPEG -2, MPEG -4, DVI

UNIT 4

Multimedia DBMS : Characteristics , Data Structure, Operations, Database Model, SGML, ODA, MHEG. **Synchronization** – Notion of synchronization, presentation requirements, Synchronization case studies –MHEG, HyTime, MODE, ACME

UNIT 5

Multimedia Application Development: Design, Development and evaluation of multimedia a system - The development of user interface design. Multimedia & the Internet, Multimedia conferencing and file sharing, Multimedia broadcasting, Multimedia Development Issues, Multimedia project - Structured Multimedia development, Multimedia project timing

REFERENCES:

- Steinmetz & Nahrstedt, "Multimedia : Computing, Communications and Applications" , Pearson Education
- Ranjan Parekh, " Principles of Multimedia" , Tata Mc-GrawHill 2006
- Mohammad Dastbaz, Designing Interactive Multimedia Systems
- Multimedia – Technology and applications David Hillman Galgotia Publications, Delhi
- Tay Vaugham, " Multimedia : Making it work", 7th Edition Tata McgrawHill 2007
- John F. Koegel Bufend , "Multimedia systems", Pearson Education, Delhi, 2002
- Ralf Steinmetz and Klara Nahrstedt "Multimedia Applications", Springer, 2007.

MCA 505 E53 -INFORMATION SECURITY AND E-COMMERCE

UNIT I

The History of Information Security ,Importance of Security,CNSS Security Model , Components of an Information System ,The Systems Development Life Cycle ,The Security Systems Development Life Cycle,The Need for Security-Business Needs ,Threats, Attacks, Secure Software Development.

UNIT II

Risk Management ,Planning for Security, Security Technology Firewalls, VPNs ,Intrusion detection, Access Control and other security Tools.

UNIT III

Overview of E- Commerce framework – E- Business models – Network infrastructure - Role of Internet – E- commerce and World Wide Web, Consumer oriented E- Commerce applications – Mercantile process models -Electronic Payment Systems –Digital Token based EPS – Smart cards – Credit cards – Risks – designing EPS.

UNIT IV

Electronic Data Interchange: EDI applications in Business – EDI and e Commerce – EDI standardization and implementation – Internet based EDI

UNIT V

Internet security standards – secure electronic payment protocols ; cryptography and authentication – security issues – encryption techniques; e commerce payment mechanisms –SET protocol – electronic check – E-commerce ethics, regulations and social responsibility.

REFERENCES:

1. Principles and Practices of Information Security, Michael E. Whitman, Herbert J. Mattord,
2. Ravi Kalakota, Andrew, "Frontiers of Electronic Commerce", Addision Wesley
3. Greenstein and Feinman, "E-Commerce", TMH
4. Electronic Commerce, By M. Green Stein, Todd M. Feinman. Tata McGraw Hill Pub. 2001.
5. Information Systems Security, Godbole, Wiley-India
6. Information Security Principles and Practice, Deven Shah, Wiley-India
7. Marilyn Greenstein and Todd M Feinman, "Electronic Commerce: Security, Risk Management and Control" Tata McGraw-Hill, 2000
8. Stallings, W., Cryptography and Network Security. Principles and Practice, 4th edition, Prentice Hall.

MCA 505 E54 - DIGITAL IMAGE PROCESSING

UNIT I

Digital Image Processing: Origins of Digital Image Processing, Steps in Digital Image Processing, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships between Pixels, Mathematical Tools used in Digital Image Processing.

UNIT II

Image Transformation & Filters: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filter, Sharpening Spatial Filters, Combining Spatial Enhancement methods, Fuzzy techniques for Intensity Transformation and Spatial Filtering. Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transforms of Sampled Functions, The Discrete Fourier Transform (DFT), Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Sharpening using Frequency Domain Filters, Selective Filtering.

UNIT III

Image Restoration, Reconstruction and Image Segmentation: Image Degradation/Restoration process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Functions, Inverse Filtering, Wiener Square Error Filtering, Constrained Least Square Filtering, Geometric Mean Filter, Image Reconstruction from Projections. Image Segmentation: Point, Line and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation.

UNIT IV

Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full Color Image Processing, Color Transformation, Smoothing and Sharpening, Image Segmentation Based on Color, Noise in Color Images. Wavelets and Multiresolution Processing: Multiresolution Expansion, Wavelet Transforms in One Dimension, The Fast Wavelet Transforms, Wavelet Transforms in Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Basic Compression Methods, Digital Image Watermarking.

UNIT V

Morphological Image Processing: Erosion and Dilation, Opening and Closing, The Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology. Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Structural Methods.

REFERENCES:

- Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education,2008.
- Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing using MATLAB",2nd Edition,
- Prentice Hall of India, 2002.
- A.Jain,"Fundamentals of Digital Image Processing", Prentice Hall of India.

MCA 505 E55 - DISTRIBUTED COMPUTING

UNIT I

Introduction to distributed systems –definition, goals, types. Architectures- System architectures, architectures versus middle ware. Processes – Threads, Virtualisation. Client-Networked User Interfaces, Client-Side Software for Distribution Transparency. Server-design issues, Distributed Servers, Code Migration-Reasons for Migrating Code

UNIT II

Communication – RPC, Message oriented Communication-Transient communication, Persistent Communication-Message queuing model, Architecture of queuing system, Message Brokers, Stream oriented Communication

UNIT III

Synchronization – Clock synchronization, Logical Clocks, Mutual Exclusion, Election Algorithms-Bully Algorithm, Ring Algorithm Consistency and replication – Data centric consistency, client centric consistency, consistency protocols.

UNIT IV

Fault Tolerance – introduction, process resilience, reliable client-server communication, reliable group communication- Basic Reliable-Multicasting Schemes, Atomic Multicast, distributed commit.

UNIT V

Security – Threats, cryptography, Secure Group Communication, access control mechanisms, security management-Key Management, Secure Group Management Distributed File Systems – Network File System, CODA, XFS

REFERENCES:

- Distributed Systems – Principles and Paradigm, Tanenbaum & Van Steen, 2nd Edition, PHI Publications
- Elements of Distributed Computing, Garg, Wiley Publications
- Distributed Operating System, Pradeep K Sinha, PHI Publications
- M.L. Liu "Distributed Computing Principles and Applications" First Edition
- Robert J. Thierauf "Distributed Processing Systems" 1978, Prentice Hall.
- George Coulouris,"Distribute System: Design and Concepts", 5th Edition Pearson Education.

MCA 505 E56 - COMPUTER GRAPHICS WITH OPEN GL

UNIT I

Introduction: Applications of Computer graphics - Input devices-Display Devices-Graphic software – Output Primitives-Points and Lines- Line drawing Algorithms- Circle generating Algorithms-Introduction to Open GL-Why OpenGL-OpenGL Drawing Primitives.

UNIT II
Transformations: Basic 2D transformations - Reflection, Shear, Composite Transformations.
Viewing Pipeline-Window to view port transformation-changing coordinate systems-Clipping-Line clipping Algorithms-Polygon Clipping Algorithms.

UNIT III
Projection: 3D Geometric transformations- Translation, Scaling, Rotation.
Perspective parallel Matrix representation – 3D viewing pipeline – 3D clipping

UNIT IV
Representations of 3D Objects : Representation of curves and surfaces –Polygon surfaces-, Quadric surfaces- Super quadrics- Blobby Objects -Bezier, B-Splines, NURBS. Representing surfaces using polygon meshes- Sweep representations, Boundary representations, Spatial-partitioning representations, Octrees, BSP trees, Constructive solid geometry- Ray casting.

UNIT V
Visible surface detection methods- Basic Illumination Models –Polygon Rendering Methods-Constant, Gouraud, Phong. Comparison of different shading methods-Ray tracing.

REFERENCES

- Hearn D., Baker M.P., Computer Graphics using OpenGL),Prentice-HallofIndia2006.
- FoleyJ.D., Andries Van Dam, Computer Graphics-Principles and Practice, Addison-Wesley.
- Angel, Edward.Interactive Computer Graphics-A Top-down Approach with OpenGL, Addison-Wesley,1996.
- Computer Graphics using Open GLFS Hill-Prentice Hall
- Geometric tools for Computer Graphics-Philip J. Schneider and David H. Eberly – The Morgan Kaufman series in Computer Graphics & Modeling.

MCA 506P ADVANCED JAVA PROGRAMMING PRCTICALS

Students are directed to develop programs on demonstrating the theoretical concepts on Advanced Java. A minimum of 20 programs is required in this practical course.

Some tentative programs that can be experimented are as follows:

1. Development of dynamic website of an online Departmental Store. The website should be user friendly and should have the following pages: • Home page • Registration and user login • User profile page • Items catalog • Shopping cart • Payment by credit card • Order confirmation

2. Add validations to the above site for registration, user login, user profile and payment by credit card using Java Script.

3. Creation of a JavaBean which gives the converted value of Temperature (in degree celcius) into equivalent Fahrenheit

4. Creation of a simple Bean with a label – which is a "count" of number of clicks. Then create a BeanInfo class such that only the "count" is visible in the Property Window.

5. Creation of two Beans a) Keypad b) Display pad. After that integrate the two beans to make it work as a calculator.

6. Do the assignment 2 using JSP by converting the static web pages of assignment 2 into dynamic web pages. Create database with User Information and Item information. The Item catalog should be dynamically loaded from the database.

7. Implementation of currency converter program using JSP Struts Framework.

MCA 507P PYTHON Programming Practicals

UNIT I

Introduction: The Process of Computational Problem Solving, Python Programming Language, Python Data Types: Numbers, Expressions, Variables and Assignments, Strings, List, Python Standard Library, Imperative Programming: Python programs, Execution Control Structures, User-Defined Functions, Python Variables and Assignments, Parameter Passing.

UNIT II

Text Files: Strings, Formatted Output, Files, Errors and Exception Handling, Execution and Control Structures: if Statement, for Loop, Two Dimensional Lists, while Loop, More Loop Patterns, Additional Iteration Control Statements, Containers and Randomness:Dictionaries ,Other Built-in Container Types, Character Encoding and Strings, Module random, Set Data Type.

UNIT III

Object Oriented Programming: Fundamental Concepts, Defining a New Python Class, User-Defined Classes, Designing New Container Classes, Overloaded Operators, Inheritance, User-Defined Exceptions, Namespaces: Encapsulation in Functions, Global versus Local Namespaces, Exception Control Flow, Modules and Namespaces.

UNIT IV

Objects and Their Use: Software Objects,Modular Design: Modules, Top-Down Design, Python Modules, Recursion: Introduction to Recursion, Examples of Recursion, Run Time Analysis, Searching, Iteration Vs Recursion, Recursive Problem Solving.

UNIT V

Graphical User Interfaces: Basics of tkinter GUI Development, Event-Based tkinter Widgets, Designing GUIs, OOP for GUI, The Web and Search: The World Wide Web, Python WWW API, Database Programming in Python.

Reference

1. LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.
2. Charles Dierbach, "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", Wiley, 2013.
3. Allen B Downey, "Think Python" ,Oreilly, 2012
4. Dr.Varghese Paul, Dr.Anjana S.Chandran,"Introduction To Computing And Problem Solving Using Python",Educational Publishers And Distributors, 2016

MAIN SEMINAR MCA508S – Semester V

Regulation for conducting Main Seminar [MCA508S]

The Main Seminar [MCA508S] of Semester 5 is intended to make MCA students aware of the Current / Future trends related to Information Technology/ Computer Science/ Computer Application.

As such, a seminar report of not less than 15 pages is to be prepared and submitted for final evaluation.

The Main Seminar is **evaluated internally** by the College and carries a total **Marks of 50** divided as follows:

1. Marks for relevance of topic and literature study (20)
2. Marks for Presentation – 2 presentations (20)
3. Marks for Seminar Report (10).

The seminar report should be prepared as per the following guidelines:

1. No of pages : Not less than 15
2. Size A4, One sided
3. Text Size 12 ; Title Size 14 Underlined; Line spacing : 1.5 Full Justified
4. Spiral Binding with uniformity in bind cover.

Every student is expected to present a minimum of 2 presentation of the seminar before the evaluation committee and for each presentation marks can be equally apportioned. A three member committee consisting of qualified **TEACHERS With PG in Computer Science / Computer Application** from the **MCA Department** has to be appointed by HoD. The Committee duly appointed will evaluate the seminar.

At the end of the semester the total marks have to be calculated and send to the University.

A Student shall have to score 50 % for getting a pass in the Seminar [MCA508S].

MCA 601D- MAIN PROJECT
Guidelines for Project Work- June 2016 Admn. onwards

The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers and Project Managers in any field related to information technology. As part of the curriculum, all students who are into their sixth semester will have to carryout a project preferably in a software industry or any research organization for duration of one full semester. The courses studied and the mini project & the main project handled at final year will give the comprehensive background to work on diverse application domains.

The objective of the MCA project work is to develop quality software solution. During the development of the project, the student should involve in all the stages of the software development life cycle like requirements engineering, systems analysis, systems design, software development, testing strategies and documentation with an overall emphasis on the development of reliable software systems. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices, so as to participate and manage a large software engineering projects in future. Students should take this project work **very seriously**, and carry out the same individually. The topics selected should be complex and large enough to justify as an MCA project. The project should be genuine and original in nature and should not be copied from anywhere else.

After the completion of this project work, the student should be able to:
- Describe the Systems Development Life Cycle (SDLC).
- Evaluate systems requirements.
- Complete a problem definition and its evaluations.
- Construct and evaluate UML's/Data flow diagrams and Data Dictionaries
- Evaluate alternative tools for the analysis process.
- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
- Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- Design and evaluate system Inputs & outputs and UI.
- Decide various data structures.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Generate various reports.
- To decide the future scope and further enhancement of the system.
- Develop of the ability to assess the implications of work performed.
- Get good exposure and command in one or more application areas and on the software
- Develop of the ability to communicate effectively.

All students are expected to work on a real-life project preferably in some Industry / Research and Development Laboratories / IT-ITES Organisations. The complete project work should be done by the student only. The role of guide should be about guidance wherever any problem encounters during project.

- **Not more than one student is permitted to work on a project**.

- Each Student should be involved in each and every phase of Project Development. If it is found that student is not involved in any phase; for example coding phase, it may lead to the rejection/disqualifying of the project at any stage.

- Title of the project should be kept the same throughout the project.

Guidelines for preparing the Project Dissertation

This document lists the contents required for the academic project report done as part of the MCA Curriculum. Section names have been listed with description. The descriptions have been provided in italics. *Important: This page and the text in italics present throughout this document are to give you guidance. Please do not include them in your project report.*

CONTENTS OF THE ACADEMIC PROJECT REPORT

1. Cover Page as per format
Use the same format given in the project doc

2. Certificate of the Company/Organization
Use the same format given in the project doc

3. Certificate of the Head Of Department as per format
Use the same format given in the project doc

4. Certificate of the Internal project guide as per format
Use the same format given in the project doc

5. Declaration
By student – format given

6. Acknowledgement
Use the same format given in the project doc

7. Revision history
Table with version, date, author, changes done, approval

8. Table of Contents
Please use the MS Word Table of content feature for this and not a manual TOC.

9. Executive Summary
This should describe the problem and the solution given by your project in brief. You should also mention the process model you used for development, methodology and technology. Limit the description to 1-2 pages.

10. Background
UP Phase: Inception

    10.1.   Existing System

Describe the system that already exists. Please note that the system could be manual or automated or a combination of both. Provide the business flow using an activity diagram.

    10.2.   Definition of Problem-

Describe the problems/inadequacies of current set up.

    10.3   Proposed System

Explain how the proposed system will solve the problems.
Provide the revised business flow involving your system using an activity diagram, if relevant.

11. Project Overview
UP Phase: Inception

    11.1.   Objective of the Project

Describe the business benefits expected from this project.

    11.2.   Stakeholders

List the stakeholders, their goals which will be satisfied by this system and the benefits.

    11.3.   Scope of the Project

Mention in brief the system proposed to meet the objective. Mention clearly if any part of the work is not in your scope – e.g. installation, or some data migration required for implementation of this system, integration with some other system etc.

    11.4   Feasibility Analysis

        11.4.1. Technical feasibility

Technology and system feasibility - The assessment is based on an outline design of system requirements in terms of Input, Processes, Output, Fields, Programs, and Procedures. This can be quantified in terms of volumes of data, trends, frequency of updating, etc. in order to estimate whether the new system will perform adequately or not

        11.4.2. Operational feasibility

Is a measure of how well a proposed system solves the problems, and takes advantages of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development

> 11.4.3. Schedule feasibility

Schedule feasibility is a measure of how reasonable the project timetable is.

> 11.5.4. Economic feasibility - Cost - Benefit Analysis

If the company had already done the analysis before deciding on the project, then obtain the information from the company and just mention it here. If this analysis was performed by the student, then explanation of how the analysis was conducted should be provided. The analysis aims to determine the benefits and savings that are expected from a candidate system and compare them with costs.

12. Overall Project Planning

UP Phase: Inception

> 12.1.   Development environment

Identify and list the technology and tools planned to be used in the development of the project – IDEs, compilers, UML tool, configuration management tool etc.

> 12.2.   Constraints

List the constraints applicable to your project e.g. time constraints, budget constraints, resource constraints, any other constraints set by the customer.

> 12.3.   Deliverables

List all deliverables expected by the customer – e.g. application, configuration files, source code, any 3rd party software packaged along with this, documents – requirements, design, user manual, installation manual, tutorial – as applicable for your project.

> 12.4.   Assumptions and dependencies

List the assumptions and dependencies made while planning the project, eg .there could be an assumption that the required inputs will be given by users or that users will be available to review the documents or that the testing team will be available to test if required etc.

> 12.5.   Risks

List any risks you foresee in the execution of this project and describe the plan to mitigate it.

> 12.6.   Process model

Mention which process model you chose to develop this project and the justification for it.

> 12.7.   Test Strategy

Mention all testing strategies – unit, integration, system, user acceptance testing that have been used.

> 12.8.   Testing environment and tools

The environment for testing should give the specifications of hardware and software used for testing. Tools used for testing if any, should be listed here.

13. Iteration Planning

UP Phase – Each iteration in each phase

> 13.1.   Schedule

Put the schedule here – activities, dependencies, start and end dates.

> 13.2.   Risks

List any risks you foresee in the execution of this iteration and describe the plan to mitigate it.

14. High level system Analysis

UP Phases: Inception

This analysis will be performed completely during inception and will be continued to be revised in the elaboration stage.

> 14.1.   User characteristics

Mention the different types of users or user groups of the proposed system and any special training needs they have in order to use this system.

> 14.2.   Summary of system features/Functional requirements

List the features identified to be part of this system in order to satisfy this goal.

> 14.3.   Non Functional Requirements / Supplementary Specification

List the non functional requirements applicable to your project related to performance, security etc.

> 14.4.   Glossary

Define the business/domain terms specific to the context of this system

14.5. Business Rules

Define the business rules specific to the user's domain/organization that need to be satisfied by this system.

14.6. Use cases

List all the use case names here and a brief description of each use case.

14.7. Use case diagram

15. Domain Model

UP Phases: Inception and Elaboration

The initial model will be identified during elaboration and will be continued to be revised in the elaboration stage. Give the analysis level class diagram, i.e. the domain model here and a brief description of the analysis level classes.

16. Use Case Model

Relevant UP Phases: Inception and Elaboration

To be developed during inception for a critical few use cases and the remaining use cases (majority) will be developed during elaboration for the majority of the use cases.

16.1. Use case text

Write the detailed use case text, in the fully dressed format for each use case. Identify the non functional requirements and rules to be followed specific to the use case being considered. Also identify the user inputs in the form of text and file inputs to system (if any). Develop the format of input which the system will accept, with examples. If it is a file input, format of file and format of data within it (if relevant) have to be provided.

Develop error messages and information texts required as part of this use case. Any external system interface requirements also need to be identified

16.2. System sequence diagram

For each use case under consideration, draw the system sequence diagram(s).

16.3. Operation contracts

For each system sequence diagram under consideration, write up the operation contracts.

16.4. Reports

Develop the format of the reports generated as part of this use case, if any.

Design Model

UP Phases: Elaboration and Construction

Developed completely in elaboration and revised in construction phase.

16.5. Sequence diagrams

Develop the design level sequence diagrams for the use case under consideration.

16.6. Class diagrams

Develop the design level class diagram for the use case under consideration.

16.7. UI design

Develop the screens identified for the use case under consideration and provide snapshots. At this stage, static screens are sufficient.

16.8. Theoretical Background

Theoretical details about the technology, tools and algorithms you have used in this project should be mentioned here in brief.

16.9. Architecture

In this section, show pictorially the logical and deployment architecture of this system. Use package diagrams, component and deployment diagrams for this.

16.10. Database design

This should give a catalogue of the data elements used in the system / sub system developed. The following are the details require for each table and field in the table. Repeat this list as many times there are tables and fields. Write NA if NOT applicable:

16.10.1. Table Name

16.10.1.1. Field Name

16.10.1.2. Length

11.4.1.1 Type CHAR, VARCHAR, NUMBER, DATE etc.

11.4.1.2 Description

17. Testing

UP Phases: Construction and Transition

Developed completely in construction and revised in transition phase.

   17.1.   Test cases

List each test case – with description, inputs, expected output, pass/fail criteria.

   17.2.   Test Report

Actual result against the expected results of test cases should be compiled here. A measure of quality like % of passed test cases should also be provided.

   17.3.   Sample Code used for testing

Sample code used for unit testing should be provided.

18. Transition

Relevant UP Phase: Transition

   18.1.   System Implementation

Describe the implementation mechanisms. Describe the method of data conversion and migration for the new system if applicable.

   18.2.   System Maintenance

Describe the plan for maintenance of the system. Mention the documents and any training provided by the student for future maintenance.

   18.3.   User/Operational Manual

If there was a user manual expected as deliverable by the customer, provide it here. If there was a demo or training given to users on the system, mention that. If there are any limitations of the system or constraints on inputs like data format, which have to be taken care by users, list it here. Also mention the details required for operation of the system. This should include instructions on how to start and shutdown the system, description of expected folder structure of system related files after installation, list of roles of users required to be created and maintained in the system.

If there are any requirements to do periodic cleaning of data, those have to be mentioned here. If the delivery of scripts or programs for automatic data cleaning is in scope, usage of the scripts should be described. Configuration management related information, if applicable, should be provided to suggest frequency of backups of files.

19. Annexure :

   19.1.   Organization profile

Give a brief background of the organization where the student has developed the project

   19.2.   Document Glossary, Figures, Tables

List of abbreviations should be provided in the document glossary. Each figure and table should be labeled. You should create an index for these like the table of contents.

   19.3.   References :

   Books: *Any references you made to books and papers should be listed here with the book name, edition, name of author and publisher.*

   Websites: *Any references you made to websites should be listed here with the URL and date of access.*

   19.4.   User Interview Questionnaires

   19.5.   Sample Project code / Algorithm if project code is not available.

The format of various certificates to be included in the Project report is appended along with this guidelines.

A Project Report
On
"PROJECT TITLE"

Submitted to the

Department of MCA

In partial fulfillment of the

MASTER OF COMPUTER APPLICATIONS

Under the guidance of

Internal Guide's Name

Project Done by

NAME OF STUDENT
(Reg No:)

EMBLEM OF COLLEGE

DEPARTMENT OF MCA

NAME AND ADDRESS OF COLLEGE

Month-Year

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

BONAFIDE CERTIFICATE

Certified that the Project Work entitled

"<u>PROJECT TITLE</u>"

is a bonafide work done by

Name of the student

In partial fulfillment of the requirement for the Award of

MASTER OF COMPUTER APPLICATIONS

Degree From

Mahatma Gandhi University, Kottayam

(Period of study)

Head of Department   *Project Guide*

Submitted for the Viva-Voce Examination held on……………………………

External Examiner1   **External Examiner2**

(Name & Signature)   (Name & Signature)

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

CERTIFICATE

This is to certify that the project entitled **"PROJECT TITLE"** has been successfully carried out by *NAME OF STUDENT* (Reg. No:) in partial fulfilment of the Course **Master of Computer Applications.**

INTERNAL GUIDE

Date: **HEAD OF THE DEPARTMENT**

NAME AND ADDRESS OF COLLEGE
EMBLEM OF COLLEGE

<u>CERTIFICATE</u>

This is to certify that the project entitled **"PROJECT TITLE"** has been successfully carried out by **NAME OF STUDENT** (Reg no:) in partial fulfilment of the course **Master of Computer Applications** under my guidance .

Date: Name of Guide

INTERNAL GUIDE

NAME AND ADDRESS OF COLLEGE
EMBLEM OF COLLEGE

<u>DECLARATION</u>

I, **NAME OF STUDENT**, hereby declare that the project work entitled **"NAME OF THE PROJECT"** is an authenticated work carried out by me at *XYZ SOFTWARE PVT. LTD.* under the guidance of **Guide's Name**   for the partial fulfilment of the course **MASTER OF COMPUTER APPLICATIONS**. This work has not been submitted for similar purpose anywhere else except to **NAME OF COLLEGE.**

 I understand that detection of any such copying is liable to be punished in any way the school deems fit.

NAME OF STUDENT

Signature

Date:
Place:

MCA602V – VIVA VOCE

The Viva-Voce Examination of 6th Semester is a comprehensive evaluation of what has been learned through the entire MCA programme.

Students will be evaluated through all core subjects of the MCA programme and marks will be awarded on the basis of oral answers given by the student.

There is no internal mark component for the same. The maximum marks for the Viva Voce examination is 100. The evaluation is done by the evaluators duly appointed by the University.