Mizoram University

Aizawl – 796 004

REVISED

Course Structure & Syllabi

for

Master of Computer Applications (MCA)

(October 2013)

PREFACE

The Master of Computer Application (MCA) course was started by Mizoram University at DOEACC, Zuangtui, Aizawl, which is now known as NIELIT form 2008. After its commencement there had been no revision of the syllabus. As MCA is subject where there is day to day changes taking place which our students need to learn to keep space in the IT sectors. Keeping this in mind, the teachers involved with the teaching of MCA courses have come forward for revision of the MCA syllabus. It had been the full efforts of all the members of the Board of Studies (BOS) in Computer Application and the members of the School Board in Physical Sciences who have tried best to give many suggestions as well as deletions for the improvement of the syllabus. They have also revised the existing Rules and Regulations for the MCA course.

The Chairman of the School Board in Physical Sciences and the BOS in Computer Application takes this opportunity to thank the Hon'ble Vice Chancellor Prof. R. Lalthantluanga for giving permission to hold the BOS and School Board meetings two times for the same purpose. He also thanks all the members of the School Board in Physical Sciences and the BOS in Computer Application for giving all the useful advices for the full revision of the MCA syllabus.

Prof. R. K. Thapa
Dean & Chairman
Board of Studies in Computer Application
Mizoram University

Date : 30th October 2013

TABLE OF CONTENTS

22	MCA 391	Assembly Language Programming & Interfacing	Practical	34
23	MCA 392	Oracle Laboratory	Practical	36
4th Semester				
24	MCA 401	Theory of Computation	Theory	37
25	MCA 402	C# .Net	Theory	38
26	MCA 403	Computer Graphics & Multimedia	Theory	39
27	MCA 404	Management Concepts & Practices	Theory	40
28	MCA 405	Information Securities	Theory	41
29	MCA 491	C#. NET Laboratory	Practical	42
30	MCA 492	Web Programming	Practical	44
5th Semester				
31	MCA 501	Java Programming	Theory	46
32	MCA 502	Artificial Intelligence	Theory	47
33	MCA 503	Software Engineering & CASE Tools	Theory	48
34	MCA (521-524)	Elective-I	Theory	54
35	MCA (531-534)	Elective-II	Theory	59
36	MCA 591	Minor Project	Practical	49
37	MCA 592	Java Programming Laboratory	Practical	52
6th Semester				
38	MCA 601	Data Warehousing & Mining	Theory	64
39	MCA 602	Operations Research	Theory	65
40	MCA 691	Major Project	Practical	66

Regulations for

Master in Computer Applications (MCA) Programme

1. Short Title and Commencement:

These Regulations shall be called the Regulations for the Master programme in Computer Applications (MCA) under the School of Physical Sciences, Mizoram University.

.

2. Duration of the Programme:

The Duration of the Programme shall be of 6 (six) semesters (or 3 Years) leading to MCA degree. Each semester shall have a minimum of 90 working days or as per Mizoram University/AICTE norms. The maximum duration shall be 10 (Ten) Semesters (or 5 years) for completion of the programme from the date of commencement of the first semester.

3. Eligibility Criteria for Admission:

The eligibility criteria for admission into 1st Semester of MCA programme shall be followed as:

a) A candidate who has passed 3 years (or Six Semesters) Bachelor's Degree (B.A/B.Sc./B.Com./B.C.A/B.B.A. or any other degree course) with at least 50% marks in aggregate or having equivalent grade from any recognized University/Institution with Mathematics as core/compulsory course at the graduation level.

b) **Lateral Entry:** A candidate who has passed PG Diploma in Computer Application from any recognized University/Institution or NIELIT 'A' Level course under Govt. of India (with at least 50% aggregate marks) and minimum of one (1) year of institutional study after Bachelor's Degree can be considered for admission into 3rd semester (Third Semester) of MCA programme, subject to the availability of the seats.

4. Selection Procedure:

a) A State Level Entrance Test for admission into MCA programme shall be conducted as per AICTE norms. The short listed candidates shall be allowed to appear in personal interview. The merit list shall be prepared based on the performance in the State Level Test and Personal Interview.

b) Reservation of seats shall be as per Mizoram University Norms.

c) In case of admission, the decision of the Admission Committee shall be final.

5. Programme Structure:

The programme shall consist of courses as detailed in the syllabus approved by the Academic Council of the Mizoram University.

6. Examination:

a) The performance of a student in a semester shall be evaluated through continuous assessment (Internal Assessment) and End Semester examination conducted at the end of each semester.

b) The continuous assessment shall be based on periodical tests, assignments/tutorials, group discussions/quizzes/viva-voce and attendance. The marks of the continuous assessment (sessional marks) shall be declared within 10 days of the date of assessment.

c) A student must attend a minimum of 75% classes during a semester to be eligible to appear in the end-semester examination. A maximum of 15% relaxation in attendance shall be considered as per the MZU rules

d) The examination at the end of the semester shall be conducted by means of written Examinations, practicals and/ or viva-voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

e) The minimum pass marks in each theory/practical paper of a semester in both Internal Assessment and end-semester examination shall be 40%, separately.

f) Practical examination will be conducted by the Parent Institution.

g) The maximum number of repeat for each paper is two (2).

h) The students are required to pass the course within a maximum of 5 Years failing which they shall have to seek a fresh admission.

i) A minimum of 5 SGPA (Semester Grade Point Average, defined at Point #12) is required to clear/pass a semester. Similarly, a minimum of 5 CGPA required to clear the MCA programme.

7. Promotion:

A student shall be allowed to continue the studies till the end of 3rd semester irrespective of the number of papers from the previous semesters in which he/she fails. But he/she will not be promoted to 4th semester unless he/she has cleared at least 50% of papers up to 3rd semester, failing which he/she shall have to seek fresh admission.

8. Re-admission in the Programme:

A student may be allowed for re-admission in the programme only once if he/she is declared fail at the end of the programme.

9. Evaluation:

The distribution of marks of Internal Assessment and End-Semester Examination shall be at the ratio 40:60. Re-evaluation will be allowed as per Mizoram University regulations.

Theory Papers:

Internal Assessment	
Home Assignment/Quiz/regularity/seminar etc.	10 marks
Internal Test	30 marks
Total	**40 marks**
External	
End Semester Examination	**60 marks**

Practical Papers:

Internal Assessment	
Practical skills/performances/regularity/assignment etc.	10 marks
Internal Test	30 marks
Total	**40 marks**
External	
Lab. Record	10 marks
Viva Voce	20 marks
Program Development and Execution	30 marks
Total	**60 marks**

Teaching Scheme(per week) in each Paper		
Lecture (hrs)	**Tutorial (hrs)**	**Practical (hrs)**
3	**1**	**4**

11. Question pattern for End-Semester examinations: The question pattern will consist of Short answers and Descriptive. The distribution of marks will be followed as:

a) Theory paper (60 Marks)

Part A: Short Answers (12 marks)

6 Questions to be answered each carrying 2 marks. 1 question from each unit to be set and other 2 questions may be set from any other units.

Part B – Descriptive (48 marks)

4 out of 8 questions to be answered each carrying 12 marks. One question from each unit to be set.

b) Practical Paper – 60 Marks

Part-A (45 marks)

Question No. 1 : 25 Marks

Question No. 2 : 20 Marks

Part-B (15 marks)

Viva : 10 Marks

Record Book : 5 Marks

c) Final Project : Full marks for final project will be 500 but will again be converted to a scale of 100 for calculation of grade or GP.

External (300 marks)

Topics	**External Marks**
Synopsis	25 Marks
SRS	25 Marks
Diagrams	25 Marks
Database Design	25 Marks
Coding Standards	25 Marks
Input-Output Design (Forms / Reports)	25 Marks
Project complexity + applicability	25 Marks

Project Report	25 Marks
Presentation	50 Marks
Viva Voice	50 Marks
Total	**300 marks**

Internal (200 marks)

Topics	**Internal Marks**
Synopsis submission	25 Marks
SRS + Design document submission + presentation	25 Marks
Coding Submission	25 Marks
Testing document submission	25 Marks
Final report documentation submission + software	50 Marks
Final demonstration + presentation	25 Marks
Project complexity + methodology used+ timely submission + coding standards	25 Marks
Total	**200 marks**

12. Grading System:

Based on overall performance of the student in each semester, the Grade shall be awarded on a Ten (10) point scale as per following scheme:

MarksRange (Out of 100)	Grade	Grade Points	Description of Performance
100-91	A+	10	Outstanding
90-81	A	9	Excellent
80-71	B+	8	Very Good
70-61	B	7	Good

60-50	C+	6	Average
49-40	C	5	Below Average/Fail
<40	Not to be considered for Awarding grades		

At the end of each end-semester examination, a student shall be awarded a Semester Grade Point Average (SGPA) which shall be calculated as

$$SGPA = \sum_{i=1}^{n} c_i g_i / \sum_{i=1}^{n} c_i$$

Where, n=Total number of papers in the semester.

C_i=Number of credits in the i^{th} paper.

g_i=Grade points earned in the i^{th} paper.

At the end of MCA programme, a student shall be awarded a Cumulative Grade Point Average (CGPA) which shall be calculated as

$$CGPA = \sum_{i=1}^{m} C_i S_i / \sum_{i=1}^{m} C_i$$

where, m=Total number of semesters in the programme.

S_i=SGPA in the i^{th} semester.

C_i=Total number of credits in the i^{th} semester.

If the comparison of the performance of a student of Mizoram University with those from the other Universities/Institute if required, the following formula for converting CGPA to percentage of marks shall be used:

Equivalent Percentage= 10 X CGPA-5, for CGPA up to 9.

Equivalent Percentage= 15 X CGPA-50, for CGPA above 9.

13. Award of Division:

On the basis of the CGPA, the result of each student shall be declared as follows:

CGPA 8.5 and above Passed in First Division with Distinction.

CGPA 6.5 – 7.4 Passed in First Division.

CGPA 5 and 6.4 Passed in Second Division.

CGPA below 5	Failed.

14. Award of Rank:

Rank will be awarded as per Mizoram University rules.

15. Removal of Discrepancy/Difficulties:

Notwithstanding anything contained in this Regulation, any discrepancy/difficulty arising in interpretation of, or giving effect to, any provision of this regulation, shall be referred to the Vice-Chancellor, whose interpretation or decision thereon shall be final.

MCA Course Structure and Marks Didstribution

First Semester

Sl. No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 101	Discrete Mathematics	3	1	0	4	100
2	MCA 102	Programming in C	3	1	0	4	100
3	MCA 103	Financial Accounting and Management	3	1	0	4	100
4	MCA 104	Digital Fundamentals	3	1	0	4	100
5	MCA 105	Computer Organization & Architecture	3	1	0	4	100
6	MCA 191	Programming Laboratory	0	0	4	2	100
7	MCA 192	Digital Electronics Laboratory	0	0	4	2	100

Total Credits: 24

Total Marks: 700

Second Semester

Sl. No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 201	Object Oriented Programming Systems	3	1	0	4	100
2	MCA 202	Operating Systems	3	1	0	4	100
3	MCA 203	Systems Analysis & Design	3	1	0	4	100
4	MCA 204	Data Structures using C	3	1	0	4	100
5	MCA 205	Numerical Analysis	3	1	0	4	100
6	MCA 291	Programming using C++	0	0	4	2	100
7	MCA 292	Data Structures using C Laboratory	0	0	4	2	100

Total Credits: 24

Total Marks: 700

Third Semester

Sl No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 301	Database Management Systems	3	1	0	4	100
2	MCA 302	Data Communication & Networking	3	1	0	4	100
3	MCA 303	Introduction to Microprocessors	3	1	0	4	100
4	MCA 304	Linux Operating Systems	3	1	0	4	100
5	MCA 305	Analysis & Design of Algorithms	3	1	0	4	100
6	MCA 391	Assembly Language Programming & Interfacing	0	0	4	2	100
7	MCA 392	Oracle Laboratory	0	0	4	2	100

Total Credits: 24

Total Marks: 700

Fourth Semester

Sl No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 401	Theory of Computation	3	1	0	4	100
2	MCA 402	C# .Net	3	1	0	4	100
3	MCA 403	Computer Graphics & Multimedia	3	1	0	4	100
4	MCA 404	Management Concepts & Practices	3	1	0	4	100
5	MCA 405	Information Securities	3	1	0	4	100
6	MCA 491	C#. NET Laboratory	0	0	4	2	100
7	MCA 492	Web Programming	0	0	4	2	100

Total Credits: 24

Total Marks: 700

Fifth Semester

Sl No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 501	Java Programming	3	1	0	4	100
2	MCA 502	Artificial Intelligence	3	1	0	4	100
3	MCA 503	Software Engineering & CASE Tools	3	1	0	4	100
4	MCA (521-524)	Elective-I	3	1	0	4	100
5	MCA (531-535)	Elective-II	3	1	0	4	100
6	MCA 591	Minor Project	0	0	4	2	100
7	MCA 592	Java Programming Laboratory	0	0	4	2	100

Total Credits: 24

Total Marks: 700

Sixth Semester

Sl No	Code No	Title	Lecture	Tutorial	Practical	Credit	Marks
1	MCA 601	Data Warehousing & Mining	3	1	0	4	100
2	MCA 602	Operations Research	3	1	0	4	100
3	MCA 691	Major Project	0	0	10	16	500*

***** This will be converted into a scale of 100 point.

Total Credits: 24

Total Marks: 700

Elective:

Code No.	Subject
Electives I (Any one approved by the Department)	
MCA 521	Advanced Computer Networks
MCA 522	Digital Image Processing
MCA 523	Distributed and Parallel Computing
MCA 524	Pattern Recognition
Electives II (Any one approved by the Department)	
MCA 531	Embedded Systems
MCA 532	Mobile Computing
MCA 533	Signal Processing & Applications
MCA 534	Cellular & Satellite Communication

Total Credits (Course) : 144

Total Marks (Course) : 4200

Lecture = Lecture T=Tutorial P=Practical

Discrete Mathematics: MCA 101

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Sets and Relations: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, minset, Partitions of sets, Relations: Basic definitions, graphs of relations, properties of relations.

Number Theory:The Principal of induction, Euclidean algorithms the greatest common divisor, equivalence relation, Fibonacci numbers.

UNIT II: **15L**

Matrix: Introduction of a Matrix, its different kinds, matrix addition and scalar multiplication, multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix, solving simultaneous equations using Gauss elimination, Gauss Jordan Methods, Matrix Inversion method.

Combinations:Basics of counting, the Pigeonhole principle, permutation and combination, Discrete Probability generating functions, recurrence notation, Divide and conquer relation, Inclusion and exclusion with applications.

UNIT III: **15L**

Propositional Logic: Proposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers. Principle of mathematical Induction.

Graph Theory : A general introduction, simple and multi graphs, directed and undirected graphs, Eulerian and Hamiltonian Graphs, Shortest path algorithms, Chromatic number, Bipartite graph, graph coloring,the travelling salesman problem,planargraphs,cutsets,minimum spanning tree.

UNIT IV: **15L**

Differential and Integral Calculas:

Binomial Theorem, Trigonometric functions and their graphs, Real numbers and real line, Functions.Limit and Continuity: L'Hospital rule, Continuity, Tangent lines, Differentiation rules, Implicit differentiation, Mean value Theorem, Extreme values, Asymptotes.

Integration: Indefinite integrals, Integration by parts, Partial Fractions, Integration by substitution,Definite Integrals, Fundamentals theorem of calculus(statement only), Properties of integrals,area, Evaluation of definite integrals.

Text Books:

1. Kenneth N. Rosen : *"Discrete Mathematics and its applications"*, Tata McGraw Hill,Seventh Edition (2011).
2. C.L. Liu : *"Elements of Discrete mathematics"*, Tata McGraw Hill,Third Edition (2008).
3. Norman.L.Biggs: *"DiscreteMathematics"*,Oxford University Press,Second Edition (2003).
4. Vinay Kumar : *"Discrete Mathematics"*, BPB, India (2002).

Programming in C: MCA 102

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction to 'C' Language: History, Function as building blocks, Language Fundamentals, Data Types, Types of operators, Operator Precedence and Associativity, Expression, Statement and types of statements.

Built-in Function and Control Structure: Console based I/O and related built-in I/O function: *printf(), scanf(), getch(), getchar(), putchar();* Concept of header files, Preprocessor directives, Control Structures.

Unit II: **15L**

Functions: Basic types, Declaration and definition, Function Call, Types of function, Parameter passing: *Call by value* &*Call by reference,* Scope of variables, Storage classes, Recursion.

Arrays: Definition, declaration and initialization, Types of Definition, Accessing and displaying array elements, Sorting arrays, Arrays and function, Memory representation of array.

Pointers: Definition and declaration, Initialization of pointer, Indirection operator, address of operator, Pointer arithmetic, Dynamic memory allocation, Arrays and Pointers, Function and Pointers.

Unit III: **15L**

Strings: Definition, declaration and initialization of strings, Standard library functions, Implementation without using standard library functions.

Structures: Definition and declaration, Variable initialization, Accessing fields and structure operations, Nested structures, Union: *Definition and declaration.*

C Preprocessor: Definition, Macro substitution directives, File inclusion directives, Conditional compilation, Storage Classes, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

Unit IV: **15L**

File Handling: Definition, Opening modes of files, Standard function: *fopen(), fclose(),eof(), fseek(), rewind(),* Using text files: *fgetc(), fputc(), fprintf(), fscanf().*

Graphics in C: Introduction,the display adapters, setting the text modes, drawing object in C :*line, circle, rectangle and ellipse.* Command Line Arguments.

Text Books:

1. YashavantKanetkar: *Let us C*, 13th Edition, BPB publications (2012).
2. E. Balaguruswamy: *Programming in ANSI C*, 6th Edition, TMG (2012).
3. Herbert Schildt, C: *The Complete Reference*, 4th Edition, TMH (2000).
4. Byron S.Gottfried, Schaums: *Outline of Programming with C*, 2nd Edition, Schaums Outlines (1996).
5. R Sethi&K.V.Viswanatha: *Programming Languages: Concepts & Constructs*, 2nd Edition, Pearson (2006).

Financial Accounting & Management: MCA 103

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Basic Accounting Concepts: Nature,Meaning& Scope of Accounting, Differences between Management Accounting and Financial Accounting, objectives of Accounting. Basic Accounting Terms.JournalazingTransactions , Rules of Debit & Credit, Compound Journal Entry, Opening Journal Entry. Sub-division of Journal, Ledger Posting,Relationship between Journal & Ledger, Rules Regarding posting.

UNIT II: **15L**

Preparation of Final Accounts: Preparation of Trial Balance.Meaning& Preparation of Trading Account, Profit & Loss Account and Balance Sheet with and without Adjustments. Rectification of errors, Location of errors, Suspense account, Rectifying Accounting entries.

UNIT III: **15L**

Management Accounting: Meaning, Functions & Scope of Management Accounting. Limitations of Management Accounting.

Analysis of Financial Statements: Meaning & Types, Nature and Limitations of Financial Statements, Analysis and Interpretation of Financial Statements. Ratio Analysis ,Types of ratios,Advantages& Disadvantages of Ratio Analysis.Dupont Analysis.Analysis of Statements of Changes in Financial Position - Funds Flow Statement and Cash Flow Statement.

UNIT IV: **15L**

Cost Accounting : Meaning, nature and importance of cost accounting,types of costs and preparation of cost sheet.Variable cost and Fixed cost, contribution, P/V Ratio, Break-Even-Point,Limitations of Cost-Volume-Profit Analysis.

Budgeting: Meaning, objectives and importance of budgeting in anorganisation, Budget &Budgetory Control. Preparation of cash budget, fixed and flexible budgets, zero-base budgeting.

Text Books:

1. S.N.Maheshwari,A textbook of Accountancy for Management,VikasPublications,Second Edition,2010.
2. R.Narayanaswamy,FinancialAccounting:AManagerialPerspective,Prentice Hall India FourthEdition, 2011.
3. MNArora:Cost and Management Accounting, VikasPublications,Eighth Edition,2009.
4. Prasanna Chandra, “Financial Management : Theory and Practices”, Tata McGrawHill 5th Edition, 2001.

Digital Fundamentals: MCA 104

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Adder and Subtracter - Binary parallel adder, carry propagation, carry Look ahead adder, Decimal adder, BCD adder, Half and full subtractor, BCD subtractor

Encoder and decoder – 3 to 8 line decoder, 2 to 4 decoder, 4 to 16 decoder, BCD to decimal decoder, Decimal to BCD Encoder, octal to binary encoder

Comparator – Magnitude comparator, 1 bit and 2 bit comparator

Multiplexer and de-multiplexer – 4:1, 8:1, 16:1 and 32:1 Multiplexer, Multiplexer tree, De-multiplexer tree.

UNIT II: **15L**

Flip Flops – 1 bit memory cell, preset and clear, JK, SR, T, D, Master-Slave flip flop

Registers and Counters – Shift register, serial transfer mode, Serial addition, 4-bit ripple counter, BCD Ripple counter, Synchronous and Asynchronous counter, 4-bit up-down counter and Johnson counter.

D/A and A/D Converters - Weighted resistor and R-2R ladder type D/A converter; Parallel-comparator type; Successive approximation type.

UNIT III: **15L**

Timing Circuits: Free running Multivibrator, Retriggerable and Non-retriggerableMonostableMultivibrator, Monostable and astablemultivibrator, Schmitt Trigger, OP AMP Comparator, Regenerative comparator, 555 Timer

UNIT IV:

15LIntroduction to Semiconductor – Doping, Intrinsic and Extrinsic, Donor and Acceptor, p-type and n-type.

p-n Junction Diode – Forward Bias, Reverse Bias, Volt-Ampere characteristics, Zener Diode, Schottky Diode.

Bipolar Junction Transistor (BJT) – Transistor Configurations, Transistor as a switch, Schottky Transistor.

MOSFET – Enhanced and Depletion MOSFET, MOS and CMOS.

Text Books:

1. Jain: *Modern Digital Electronics*, 3rd Edition, Tata Mcgrow Hill (2010).
2. Morris Mano: *Digital Logic Design*, 5th edition, Prentice Hall of India (2008),
3. H.Taub&D.Shilling: *Digital Integrated Electronics*, 2nd Edition, McGraw Hill (1999).
4. Givone: *Digital Principles & Design*, 1st Edition, Tata Mc Grow Hill (2002).
5. Virendra Kumar: *Digital Technology*, 1st edition, New Age (1999).

Computer Organization & Architecture: MCA 105

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction to Computer Arithmetic:

Decimal Representation, Complements, Fixed point representation, Addition, Subtraction with Signed- magnitude, Signed 2's Complement method, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm, hardware Implementation, Floating Point Arithmetic operations.

Register Transfer Language:

Register Transfer, Bus and Memory transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic logic and shift operations.

Unit II: **15L**

Instruction Set Design :

Assembly/machine language, Von Neumann machine cycle, Microprogramming/firmware, Memory addressing, Classifying instruction set architectures, Computer Registers, General Registers Organization, Computer Instructions, Timing and control, Instruction Cycle, Memory Reference Instructions, Input-output and interrupt, Instruction Format, Addressing modes, Data transfer and manipulation, program Control, RISC and CISC.

Pipelining :

General considerations, Comparison of pipelined and nonpipelined computers, Instruction and arithmetic pipelines – examples, Structural hazards and data dependencies, Branch delay and multicycle instructions, Superscalar computers

Unit III: **15L**

Programming the Basic Computer:

Introduction to Machine Language, Assembly language, Program loops, Programming arithmetic and logic operations, Subroutines, Input-output programming.

I/O Fundamentals:

Typical I/O devices, Programmed I/O, Peripherals Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of transfer, Priority Interrupt, DMA, I/O Processor, CPU-IOPCommunication, Serial Communication, Interrupts and DMA, I/O bus operation, TRAP instruction, Role of OS.

Unit IV: **15L**

Memory Organization :

Memory Hierarchy, Main memory, Auxiliary Memory, Associative memory, Cache memory, Virtual Memory, Memory management hardware, Case study of PC architecture and hardware, bias and interrupts, DMA control, Different types of bus, ISA, EISA.

Multiprocessor and Multiple Computers :

SISD, SIMD and MIMD architectures, Centralized and distributed shared memory-architectures.

Text Books:

1.M. Morris Mano, "Computer System Architecture", Pearson Education, Third Edition,2008.
2.Carter Nicholas, "Computer Architecture", Schaun outline Sevies , Tata McGraw-Hill, Second Edition, 2010.
3.J.P. Hayes, "Computer Architecture & Organization", Tata McGraw Hill,Third Edition, 1998.
4.David A Patterson and John L Hennessy, "Computer Architecture: A Quantitative Approach" , Morgan KaufmnnPublishers,Fourth Edition,2006.

Programming Laboratory: MCA 191

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2**
(0-0-3)

List of Experiments: (Using Turbo C):

1. Write a C program to find the sum of digit.
2. Write a C program to find the sum of odd numbers and even numbers.
3. Write a C program to display n Fibonacci nos.
4. Write a C program to find the sum of all prime numbers between N to M.
5. Write a C program to find the reverse of a number.
6. Write a C program to check whether the given number is a prime or not.
7. Write a C program to calculate Floyd's Triangle.
8. Write a recursive function to find factorial of the given number.
9. Write a C program to check whether the string entered is palindrome or not.
10. Write a C program to print the sum of all the prime numbers between 1-100.
11. Write a C program to create pyramid with size n.
12. Write a C program to convert the entered string lowercase into uppercase and uppercase into lowercase.
13. Write a C function that has three inputs which are integers. The function returns true if the first number raised to the power of the second number equals the third number.
14. Write a C program to search for an item in n number of elements using linear search.
15. Write a C program to count the number of vowel and consonant in a given string.
16. Write a C program to find the roots of a quadratic equation.
17. Write a C program using array of structure to print the details of a students like Roll no, name, address, city and phone number.
18. Write a C program to swap two numbers using call by reference.
19. Write a C program to extract words from any text file and store in another file. Sort the words in alphabetical order and store them in the same file. Read the sorted file and print the frequency of each word.
20. Write a C program to create one text file, store some information into it and print the same information on terminal.
21. Given a file which contains some integers. From this file create another two files one for odd and second for even numbers. Print the result of both files.
22. Create one file and insert some information using fprintf() and fscanf() function.
23. Write a C program to draw a line, rectangle, circle, ellipse by using graph.
24. Write a C program to change the color and the font of a given text.

Digital Fundamentals Laboratory: MCA 192

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments:

1. Implementation of the following Logic Gates -
    a) Logic Gates AND
    b) Logic Gates OR
    c) Logic Gates NOT
    d) Logic Gates XOR
    e) Logic Gates NAND
    f) Logic Gates NOR
2. Implementation of SOP form.
3. Implementation POS form.
4. Study of half adder circuits.
5. Study of full adder circuits.
6. Study of half subtractor.
7. Realization of SR flip flop.
8. Realization of JK flip flop.
9. Realization of T flip flop.
10. Realization of D flip flop.
11. Study of 3 bit binary counter.
12. Study of 1 bit comparator.

Object-Oriented Programming Systems: MCA 201

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction: Concept, Benefits and Application of OOP, Structures of C++ Programming, Data types, Operators in C++, **Functions in C++:** Function Prototyping, Call by value, Call by reference, Return by reference, Inline Functions, Default arguments, Function overloading, Friend and Virtual Functions, **Built-in Function and Control Structure:** Console based I/O and related built-in I/O function, Static data members and member functions,Concept of header files, Preprocessor directives, Control Structures: Decision making and Branching, Loop Control Structures, Other statements : *Break, Continue, Goto, Exit,* Dynamic memory allocation and deallocation.

Unit II: **15L**

Classes and Objects: Introduction to classes and creating objects, Friend classes, Static class members, Nested classes, Memory allocation for objects, Array of objects, Objects as function arguments, Constructor and Destructor.

Manipulating Strings: Introduction, Creating (string) objects, Manipulating String Objects, String characteristics and uses.

Unit III: **15L**

Inheritance, Pointers, Virtual Functions and Polymorphism: Definition, Types of inheritance, Virtual base classes, Abstract classes, Pointer to objects, pointer to derived class, Pure virtual functions, Operator overloading, Early vs. late binding.

Unit IV: **15L**

I/O System Basics: C++ streams, C++ stream classes, Formatted I/O, Unformatted I/O operations, Overloading << and >>, Extractor and manipulator functions.

File I/O and Array Based I/O: Classes for file stream operations, Opening and closing of file, detecting EOF, Random access, I/O status, Array based class, Dynamic arrays

Templates and Exception Handling: Generic Functions, Templates, class templates, function templates, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception

Text Books:

1. E Balaguruswamy: *Object Oriented Programming with C++*, 5th Edition, TMH (2011).
2. YashavantKanetkar: *Let Us C++*, 2nd Edition, BPB (2002).
3. Herbert Schildt: *C++: The Complete Reference*, 4th Edition, TMH (2003).
4. Deitel&Deitel: *C++: How to Program*, 6th Edition, PHI (2008).
5. K R Venugopal&RajkumarBuyya: *Mastering C++*, 2nd Edition, TMH (2013).

Operating Systems: MCA 202

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction: Introduction of Operating System objective and function, Evolution of OS. **Types of O.S.:**Mainframe, Desktop, Multiprocessor, distributed, Client-Server, Clustered and Real-Time Systems. Hardware Protection.**Operating System Structure**: System components, Operating system services, System calls, System Programs, System structure.**Process Management:** Concept of Process, process scheduling, operations on processes, Interprocess communication, Sockets, Remote procedure Call,**Threads:** Overview, Multithreading models, Pthreads.

Unit II: **15L**

Process Synchronization: Critical Section, Semaphore, Classical problem of synchronization, Monitors.**CPU Scheduling:** Scheduling concepts, preemptive & non preemptive scheduling, Scheduling criteria, Scheduling algorithms (FCFS, SJF, RR, Priority, multilevel queue, multilevel feedback queue, Multiprocessor, Real-time scheduling), Algorithm evaluation. **Deadlocks:**System model, Deadlock characterization, Deadlock Prevention, Deadlock avoidance and Deadlock detection, Recovery from deadlock. **Memory Management:** Background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

UnitIII: **15L**

Virtual Memory: Demand Paging, performance, Page Replacement algorithms (FIFO, Optimal, LRU, LRU approximation, Counting-based page replacement), Allocation of frames, Thrashing. **File Systems:** File concept, access method, directory structure,protection, file-system structure, implementation, allocation methods, and free-space management.**I/O Management:** Overview,I/O hardware (polling, interrupts, DMA), application I/O interface, kernel I/O subsystem.

UnitIV: **15L**

Disk Management: Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN& LOOK scheduling), Disk management, RAIDstructure.**Distributed system:** Definition, advantages, types of distributed OS.**Protection& Security:** Goals of protection, domain of protection, the security problem, program threats**,** system threads.

Text Books:

1. Silberschatz A., Peter B. Galvin, Greg Gagne: *"Operating System Concepts"*, 9th Edition, John Wiley & Sons, Inc. (2013).
2. M. Milenkovic: *"Operating System : Concept & Design"*, 2nd Edition, McGraw Hill (2001).
3. H. N. Dietel: *"An Introduction to Operating Systems"*, 3rd Ed., Addison Wesley (2003).
4. Tanenbaum, A. S. Woodhull: *"Operating System Design & Implementation*", 3rd Ed. Pearson, (2006).

Systems Analysis & Design: MCA 203

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction of System: System Definition and concepts: General Theory systems,Types if systems, Basic principles of successful systems, Approaches to system development, Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.

System Development Cycle:Introduction to SDLC. Various phases of SDLC, Documentation:Principles of Systems Documentation, Types of documentation and their importance.

Unit II: **15L**

System Planning: Data and fact gathering techniques: Interviews, Group Communication - Questionnaires; Assessing Project Feasibility. Modern Methods for determining system requirements.

System Design &Modelling:Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity /Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description: Structured English, Decision Tree, Table.

Unit III : **15L**

Input/Output and Interface Design :

Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files,Designing Databases, Introduction to CASE Tools; Features, Advantages andLimitations of CASE Tools, Awareness about some commercial CASE Tools.

System Implementation & Maintenance: Input/Output& Interface Design,Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation. Preparing, User Manual, Maintenance Activities and Issues.

Unit IV: **15L**

OO Analysis &Design :OO Development Life Cycle and Modeling. Static and dynamic modeling.Comparison of OO and Module-oriented Approach. Modeling using UML ; The UML diagrams; the process of Object modeling.

Introduction to MIS : Meaning and role of MIS, Systems approach to MIS. Types of information systems, Case Studies (Illustrative) : MIS for Accounting and Finance Function, MIS for Marketing System.

Text Books:

1. J.A.Hoffer, J.F.George, J.S.Valacich, and P.K.Panigrahi: *"Modern Systems Analysis and Design"*, Pearson Education, Fourth Edition (2006).
2. Dennis and B. H. Wixom: *"Systems Analysis and Design"*, John Wiley & Sons, Fifth Edition (2012).
3. J.L.Whitten, L.D.Bentley: *"Systems Analysis and Design Methods"*, Tata McGraw-Hill,7th Edition (2008).
4. Kendall & Kendall: *"Systems Analysis and Design"*, Pearson Education,Seventh Edition (2007).

Data Structures using C: MCA 204

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Analysis of Algorithms:Rate of growth, time complexity and space complexity,O-notation, Omega notation and theta notation.
Introduction to data structure: Definition,Primitive and composite, Static and Dynamic.
Linked List: List vsArrays,Concept and Structure of linked list,Operations on linked list.
Complex Linked List structures: Circularly-LinkedList,Doubly Linked List, Multilinked Lists

UNIT II: **15L**

Stacks: LIFO structure,Operations on stacks,Representation of stacks as arrays and linked list.
Queues: FIFO structure,Operations on queues,Representation of queues as arrays and linked list. Priority Queues, Circular Queues.
Trees: Implementing Binary Trees,Traversal (breadth-first, depth-first),Expression Trees(Infix, Prefix, Postfix Traversals),Search Trees,Binary Search Trees.

UNIT III: **15L**

Sorting: Bubble Sort, Selection Sort,InsertionSort,Shell Sort ,Quick Sort,Heap sort, Radix Sort,Merge Sort.
Searching: Sequential Search ,Binary Search,Binary Search Tree.
Hashing Techniques: Address calculation techniques, Common hashing functions,Collision resolution

UNIT IV: **15L**

Graphs: Terminology,Operations (Add vertex, Delete Vertex, Add Edge, Delete Edge, Find Vertex),Traverse Graph (Depth-First, Breadth-First),Graph Storage Structures (Adjacency Matrix, Adjacency List)
Graph Algorithms: Shortest Path Algorithm, Networks(Maximum flow),Minimum Spanning Tree, Dijkstra's algorithm, Kruskal's algorithm, Prim's algorithm, Warshall'salgorithm.

Text Books:

1. AM Tanenbaum, Y Langsam & MJ Augustein: *"Data structure using C"*, Prentice Hall India, 1st Edition (1989).
2. Seymour Lipschutz: *"Data Structures with C (Schaum's Outlines)*", Tata McGraw Hill, 2 Edition (2010).
3. Ashok N Kamthane: *"Introduction to Data Structures in C"*, Pearson Education India, 1st Edition (2008).
4. Narasimha Karumanchi: *"Data Structures and Algorithms Made Easy"*, Career Monk Publications, 2nd Edition (2011).

Numerical Analysis: MCA 205

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Finite Differences: Introduction, Forward, Backward and Central differences, Factorial Notation, Difference Operators.

Interpolation: Newton's Forward and Backward Interpolation Formula, Gauss's Forward and Backward Interpolation Formula, Lagrange's Interpolation Formula, Newton's Divided Difference Formula, Everett and Bessel Interpolation formulae, Lagrange's, Hermite and spline interpolation.

Curve Fitting: Introduction, Linear Law and Laws reducible to Linear Law, Graphical Method, Least Square Method, Fitting of other curves.

UNIT II: **15L**

Solutions of algebraic and transcendental equation: Introduction, Bisection method, Newton-Raphsan method, Newton's method for multiple roots, Lin-Barstow's and Graffe's method for complex roots.

Solution of Simultaneous Equations: Introduction, Gauss elimination, Gauss-Jordan method, Gauss-Siedel Methods.

Matrix Inversion and Eigen Value Problem: Introduction, Matrix inversion:Gauss elimination method,Gauss Jordan method,Factorization method, Partition method,Eigen value and Eigen vector, Power method, Jacobi method,Given method

UNIT III: **15L**

Numerical Differentiation and Integration: Formulae for derivatives, Trapezoidal, Simpson's one-third and three-eighth Rule, Weddle, rule, Gauss-Legendre methods of integration.

Differential Equations: Picard's method, Euler's and Modified Euler's method, Runge-Kutta methods, Predictor-Corrector methods- Milne's and Adams-Bashforth methods.Solution of simultaneous differential equations. Solutions of second order differential equations.

UNIT IV: **15L**

Algorithms: Newton's Interpolation, Gauss elimination and Gauss-Siedel method, Simpson's 1/3, 3/8 rule and Trapezoidal rule of numerical integration, Euler's method and Runge-Kutta methods of differential equation.

Text Books:

1. B. S. Grewal: *"Numerical Methods"*, Khanna Publications, 8th Edition (2009).
2. S.S. Shastri: *"Numerical Methods",PHI* publications,*4th Edition* (2005).
3. M. K. Jain &Iyengar: *"Numerical Methods"*, New Age International, 5th Edition (2003).
4. V. Rajaraman: *"Computer Oriented Numerical Methods*", PHI publications, 3rd Edition (1993).
5. K. SankaraRao: *"Numerical Methods"*, PHI publications, 3rd Edition (2007).

Programming in C++: MCA 291

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments: (Using Turbo C++)

1. Write a cpp program to find a perfect number.
2. Write a cpp program, which explain concept of “array of object".
3. Write a cpp program, which explain concept of “object as an arguments".
4. Write a program to evaluate the functions to 0.0001% accuracy.

   $SUM=1+(1/2)^2+(1/3)^3+(1/4)^4+...$
5. Write a cpp program for a friend function.
6. Write a cpp program for a function friendly to two classes.
7. Write a cpp program for class with constructors.
8. Write a cpp program for overloaded constructors.
9. Write a cpp program of parameterized constructors.
10. Write a cpp program of copy constructors.
11. Write a cpp program of implementation of destructors.
12. Write a cpp program for implementation of unary minus operator.
13. Write a cpp program for implementation of binary plus (+) operator.
14. Write a cpp program for implementation of a single inheritance of public data member.
15. Write a cpp program for implementation of a single inheritance of private data member.
16. Write a cpp program of multilevel inheritance.
17. Write a cpp program of multiple inheritances.
18. Write a cpp program of hybrid inheritance.
19. Write a cpp program of virtual base class.
20. Write a cpp program which use constructors in derived class.
21. Write a cpp program for implementation of pointers to objects.
22. Write a cpp program for implementation of this pointer.
23. Write a cpp program for implementation of virtual function.
24. Write a cpp program of working with single file. (Creates a file with constructor function).
25. Write a cpp program of working with multiple files (creates a file with open( ) function).
26. Write a cpp program that demonstrates several exception types being caught with the catch(.....) exception handler.
27. Write a program to read a list containing item, name, item code, and cost interactively and produce a three column output as shown below.

NAME	CODE	COST
Turbo C++	1001	250.95
C Primer	905	95.70
-------	----	-------
-------	----	-------
-------	----	-------

Note that the name and code are left-justified and the cost is right-justified with a precision of two digits. Trailing zeroes are shown.

Data Structures Laboratory using C: MCA 292

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments:

1. Write a program in C to demonstrate Arrays for the following operations: Create, Display, Search, Modify.
2. Write a menu driven program that implements singly linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort.
3. Write a menu driven program that implements singly linked list for the following operations: Create, Display, Merge, Union, Intersection, Difference.
4. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort.
5. Write a program in C to implement simple Stack as an array for the following operations: Create, Push, Pop, Search, Delete.
6. Write a program in C to implement simple Stack as linked list for the following operations: Create, Push, Pop, Search, Delete.
7. Write a program in C to implement simple Queue as an array for the following operations: Create, EnQueue, DeQueue, Search, Delete.
8. Write a program in C to implement simple Queue as linked list for the following operations: Create ,EnQueue, DeQueue, Search , Delete.
9. Write a menu driven program that implements Singly circular linked list for the following operations:Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
10. Write a menu driven program in C to
    a. Create a binary search tree
    b. Traverse the tree in Inorder, Preorder and Post Order
    c. Search the tree for a given node and delete the node
11. Write a C program to implement
    a. Bubble Sort
    b. Selection Sort
    c. Insertion Sort
12. Write C program to implement
    a. Shell Sort
    b. Heap sort
13. Write C program to implement
    a. Radix Sort
    b. Merge Sort
14. Write a program to implement double hashing technique to map given key to the address space. Also write code for collision resolution (linear probing)
15. Write a program in C to represent graphs as adjacency matrix, adjacency list.
16. Write a program in to implement graphs operations : Add vertex, Delete Vertex, Add Edge, Delete Edge, Find Vertex
17. Write a program in C to implement Breadth First search and Depth First Search using linked representation of graph.
18. Write a program in C to implement Dijkstra's shortest path algorithm for a given directed graph.
19. Write a program in C to insert and delete nodes in graph using adjacency matrix.
20. Write a program in C to create a minimum spanning tree using Kruskal's algorithm.
21. Write a program in C to create a minimum spanning tree using Prim's algorithm.

Database Management Systems: MCA 301

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT -I: **15L**

Introduction*:*Characteristics of Database Approach, Advantage of using DBMS Approach, Brief History of Database Applications.**Database System Concepts and Architecture**: Data Models, Schemas, Instance, Three-schema Architecture and Independence, Database Languages and Interfaces, Database System Environment, Classification of Database Management System.**Entity Relationship Model***:* Entity Types, Entity Sets, Attributes and Keys, Relationship Types and Sets, Weak Entity Types.

UNIT-II: **15L**

Enhanced Entity-Relationship Model*:* Sub-classes, Super-classes, Inheritance, Specialization and Generalization, Data Abstraction, Knowledge Representation and Ontology Concepts.**Relational Database***:* Relational Model Concepts, Relational Model Constraints, Relational Database Schemas, Update operations, transactions and dealing with Constraints Violations.**Relational Algebra***:* Unary and Binary Relational Operations, Relational Algebra Operations from Set Theory, Tuple Relational Calculus, Domain Relational Calculus.

UNIT-III: **15L**

SQL*:* SQL Data Definition and Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic and More Complex SQL Queries, Statements (SELECT, UPDATE, DELETE) in SQL, Assertions, Triggers, Views in SQL, Database Programming with Function Calls (SQL/CLI, JDBC). **Normalization***:* Functional Dependencies, Normal Forms (First, Second, Third, Fourth, Fifth, Boyce-Codd), Dependencies (Multi-valued, Join, Inclusion). **Query Execution***:* Algorithms (External Sorting, SELECT, JOIN, PROJECT, Set Operations), Query Optimization using rule based and heuristics.

UNIT-IV*:* **15L**

Transaction Management*:* Transaction Processing, Transaction and System Concepts, ACID Properties, Schedules, Types of Schedules, View, Serializability. **Concurrency Control***:* Two-Phase Locking Techniques, Concurrency Control by Timestamps, Concurrency Control by Validation, Concurrency Control by Multi-version.**Recovery Management:** Recovery Concepts, Recovery Techniques (Deferred and Immediate Update), Shadow Paging.

Text Books:

1. ElmasriRamez and B. NavatheShamkant : *Fundamentals of Database Systems*, 6th Edition Pearson (2010).
2. Silberschatz Abraham, F. KorthHery and S. Sudarshan: *Database Concepts*, 6th Edition, McGraw Hill (2010).
3. Jeffrey. D. Ulman: *Principles of Database Systems*, Second Edition, W.H.Freeman & Co Ltd (1988).
4. C.J.Date: *Introduction to Database Management*, 8th Edition, Addison-Wesley (2003).

Data Communication & Networking: MCA 302

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit-I: **15L**

Introduction to Networks, Point-to-point connection, Multipoint connection, Physical Topology, Categories of Netwok: LAN, WAN, MAN, The OSI Reference Model, TCP/IP Model, Analog and Digital Data & Signals, Periodic Analog Signals, Digital Signals, Transmission impairment, Data rate limits: Nyquist Bit Rate, Shannon Capacity.

Unit-II: **15L**

Digital Transmission: Digital-to-Digital Conversion, Analog-to- Digital Conversion, Digital-to-Analog Conversion, Analog-to-Analog Conversion, Multiplexing: FDM, WDM, Synchronous Time division multiplexing, Transmission media: Guided Media, Unguided Media: Radio Waves, Microwaves, Infrared.

Unit-III: **15L**

Data link Layer: Error detection and correction: Hamming Distance, Minimum Hamming Distance, Parity check, CRC, Checksum, Framing: Fixed-Size framing, Variable-Size framing, Flow and error Control, Noiseless Channels: Simplex, Stop-and-Wait protocol, Noisy Channels:Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Piggybacking.
Multiple Access: Random Access: ALOHA, CSMA, Channelization: FDMA, TDMA, CDMA.

Unit-IV: **15L**

Network layer: Addressing: IPv4 and IPv6 , subnetting; Routing : Routing table , Routing algorithms, Unicast and multicast routing protocols, ARP, RARP, IP, ICMP.
Transport layer: UDP, TCP, SCTP, Congestion control algorithms, Quality of service.
Application layer: Client Server Model, Domain Name System (DNS), Application layer protocols.**Security:** Symmetric Encryption Algorithms, Public Key Cryptography, Digital Signatures, Authentication of Systems, Firewalls.

Text Books:

1. B. A. Forouzan: *Data Communications and Networking*, (3rd Ed.), TMH.
2. W. Stallings: *Data and Computer Communications*, (5th Ed.), PHI/ Pearson Education.
3. S. Tanenbaum: *Computer Networks*, (4th Ed.), Pearson Education/PHI.
4. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley.
5. Black: *Data & Computer Communication*, PHI
6. William Stallings: *Cryptography and Network Security: Principles and Practice*, Prentice Hall of India. Leon, Garica, Widjaja, Communication Networks, TMH.

Introduction to Microprocessors: MCA 303

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Brief introduction to Microprocessors & Microcontrollers

Organization of the Intel 8085: MPU Block Diagram, Pin Description, Generating Control Signals, and Demultiplexing Address / Data Bus. Instruction Set of the 8085: Data Transfer. Arithmetic and Logic-operation, Branching, Stack and subroutines.

UNIT II: **15L**

Problems using Instruction set. 8085 interrupts, vectored interrupts, Enabling & Masking Interrupts. DMA and Device Polling. Interfacing: The Address Map, Address Decoding Techniques, Memory Interfacing. Design of I/O Ports using 8255 PPI, I/O Mapped I/O and Memory Mapped I/O, Interrupt Driven and status check data transfer.DAC 0800 and ADC 0800 Interfacing Technique.

UNIT III: **15L**

The Intel 8086 architecture, segmented memory and the need for memory segmentation.16-bit address and 20-bit Address generation. Reset operation, wait state, Halt state, Hold state, Lock operation, and interrupt processing. Addressing modes and their features, instruction set of 8086, Introduction to Programming.

UNIT IV: **15L**

Brief overview of Intel 8051 Microcontroller, Architecture and Instruction set. Introduction to programming 8051 microcontroller.

Text Books:

1. Gaonkar,Ramesh S: Microprocessors, architecture, programming & applications with 8085/8085A, CBS Publishers,Fifth Edition,2011.
2. Hall, Douglas V: Microprocessors, Programming and application with the 8086, Tata McGraw Hill, Second Edition,2005.
3. Ayala, Kenneth J :The 8051 Microcontroller,CengageLearning,Third Edition,2004.
4. Soumitra Kumar Mandal,Microprocessors &icrocontrollers:Architecture,Programming and Interfacing Using 8085, 8086 and 8051, First Edition, 2011.

Linux Operating Systems: MCA 304

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

Unit I: **15L**

Introduction: Linux Evolution, Main characteristics of Linux OS, Linux Distributions, Basic Linux commands and administration, General kernel responsibilities, Kernel Overview, Kernel modules, Linux versus other Unix like Kernels.

Memory Addressing- Memory Addresses, Segmentation in Hardware, Segmentation in Linux, Paging in Hardware, Paging in Linux, Page Frame Management, Swapping, Swap Cache.

Unit II: **15L**

Processes- Process structure, Process Table, Viewing processes, System processes,

Process scheduling- Scheduling policy, The Scheduling Algorithm, System calls related to scheduling, Starting New processes, Waiting for a process, Zombie process.

Signals-The Role of signals, Generating a signal, Delivering a signal, System calls related to Signal Handling.

Unit III: **15L**

Interprocess communication- Pipes, FIFOs, System V IPC, POSIX Message Queues.

Virtual file system- Virtual file system data structure, File system types, File system mounting, File locking, The Ext 2 and Ext 3 File system.

I/O Architectures and Device Drivers- I/O Architecture, Device Driver Model, Device driver, DMA, Character device driver.

Unit IV: **15L**

Block Device Drivers- Block device handling, Generic block layer, Block device drivers.

System startup- BIOS, Boot Loader, setup function, startup_32 function, start_kernel function.

Modules- Module implementation, Linking and Unlinking modules, modprobe program, request_module() function.

Text Books:

1. Daniel P Bovet & Macro Cesati: *'Understanding the Linux Kernel'*, 3 rd Ed., O'Reilly, (2005).
2. Richard Peterson: *'Linux: The Complete Reference'*, 6th Edition, McGraw Hill, (2008).
3. JonathanCorbet&Alessandro Rubini: *'Linux Device Drivers*',O'Reilly, 3 rd Ed., (2005).
4. KarimYaghmour: *'Building Embedded Linux Systems'*, O'Reilly, 2 nd Ed., (2008).
5. Michael Beck, Harald Bohme: *'Linux Kernel Internals'*, 3rd Edition, Pearson (2002).

Analysis & Design of Algorithms: MCA 305

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I:

15L

Introduction: Analyzing algorithm, growth of functions, asymptotic notation, standard notation and common functions.
Elementary Data Structures: Stacks,Queues,LinkedLists,Graph,Trees,Set and Dictionaries
Matrix operations: Properties of matrices,Strassen's algorithm for matrix multiplication
Red-Black Trees: Properties of red-black trees, Rotations, insertion, deletion.

UNIT II: **15L**

Sorting: Selectionsort,BubbleSort,Insertion Sort, Quick Sort,Merge Sort, Heap Sort, Counting Sort,RadixSort,BucketSort,Topological Sort.
Searching: Sequential search,BinarySearch,Binary Search Tree, Depth First search,Breadth First Search, Exhaustive search- traveling salesman problem,knapsackproblem,assignment problem

UNIT III: **15L**

Greedy Algorithm: Prim's Algorithm, Dijkstra'sAlgorithm,Kruskal'salgorithm,Huffman Code.
Dynamic Programming: Elements of Dynamic Programming, Matrix –chain multiplication, Optimal binary search tree, The Floyd-Warshall algorithm, All-Pairs Shortest Paths: Shortest paths and matrix representation,

UNIT IV: **15L**

Linear Programming: Stander and slack forms, Formulating problems as linear programs, The Simplex algorithm.
Maximum Flow : Flow networks, The Ford- Fulkerson method, Max-flow- min-cut theorem. Push –relabel algorithm.
Backtracking: n-Queen problem,Hamiltonian circuit problem,Subset-Sum problem

Text Books:

1. AnanyLevitin: *Introduction to the design and analysis of algorithms*, 3rd Edition, Pearson (2011).
2. Cormen&Leiserson: *Introduction to Algorithms*, 3rd Edition, PHI (2009).
3. Horowitz, Sahni: *Fundamentals of Computer Algorithms*, Galgotia publications,2nd Edition (2007).
4. SachinDevGoyal: *Design and Analysis of Algorithm*,Laxmi Publications, Ltd., (2009).

Assembly Language Programming & Interfacing: MCA 391

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments:

8085 programs: (Any five to be performed)

- Multiplication of two 8-bit numbers.
- Division of one 8-bit value by a smaller 8-bit value, and store the remainder & quotient in memory.
- To count the no of binary 1's in the result of arithmetic or logical operation
- To copy the lower nibble of the result of arithmetic or logical operation into both nibbles of other register.
- To complement a block of data at a block of memory.
- To transfer a block of data at a block of memory to another block of memory.
- To find the largest / smallest among 3 numbers in a contiguous memory.
- To sort 15 numbers in an array in contiguous memory in ascending / descending order.
- To find the square of any 8-bit number using addition of successive odd integers.
- To find the square root of any perfect square 8-bit number using subtraction of successive odd integers.

8086 programs: (Any five to be performed)

- To print "Hello World"
- To check if a given string is palindrome or not.
- To count the no character 'e' in a given string.
- To calculate the factorial of any number 'n', input from the keyboard prompt.
- To convert a given temperature of Fahrenheit into its equivalent degree Celcius.
- To convert a given degree Celsius into Fahrenheit.
- To convert a given string characters into all upper-case.
- To convert a given string into all lower-case.
- To reverse any given string and print it out at the monitor.
- To sort a given array of elements in ascending / descending order.
- To count the number of words in a given string.
- To count the total number of vowels in a given string.
- To find the greatest / smallest among an array of elements and print it to the monitor.

8051 programs: (Any five to be performed)

- To exchange the content of Internal RAM location 7FH and external RAM location 6700H.
  To store the higher nibble of register R7 into both nibbles of register R6.
- To subtract R5,R4 pair from R7,R6 pair and store the result (lower byte) in 35H and (higher byte) in 36H.
- To divide R0 by R1 and store the quotient in R2 and remainder in R3, and restore the original content of R0.
- To transfer a block of data from internal memory range 30H to 40H into external memory block of the range 6750H to 6760H.
- To find the number of equal bytes between two memory blocks of the range 10H to 20H and 6500H to 6510H.
- To find the sum of numbers in a memory block starting from 20H to 25H and store the 16-bit result in 30H (lower byte) and 31H (higher byte)

Oracle Laboratory: MCA 392

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments: (Oracle 9i or higher version)

1. Creation, altering, dropping, truncating tables, creating table with constraints and inserting rows into a table.
   SELECT commands – all rows, distinct rows, using where command
2. Joins – Cartesian products, inner join, outer join (left , right ,full)
   TCL-Commit, Rollback, DCL- Grant, Revoke on System and Object Privilege
3. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING
5. Creation, altering, dropping of Indexes.Creation, altering, dropping of Views. Creating simple and complex views
6. Queries using
   a) Conversion functions:-to_char, to_number and to_date.
   b) String functions :- Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr.
   c) Date functions :-Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date.
7. Running PL/SQL block, Displaying message- dbms_output and put_line, Statements – Decision making, Looping, Goto
8. Function and procedures- creation, running, dropping, mode of parameter(IN,OUT,INOUT)
9. Cursor- Declaring, Open, Fetching data, closing, loop in cursor, parameter passing.
10. Triggers- creation , types(before statement,afterstatement,beforerow,after row),deleting

Theory of Computation: MCA 401

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Theory of Automata: Finite Automata, Transition diagram, Acceptability of strings, DFA, NFA, Equivalence of DFA and NFA, Mealy and Moore Machine, Minimization of finite Automata.
Formal Language: Basic Definition, operations of languages, grammar and the language generated by grammar, Chomsky classification.

UNIT II: **15L**

Regular Sets and Regular grammars: Regular expression and regular sets, pumping lemma for regular sets, closure properties for regular sets, Regular Sets and Regular grammars.
Context-free languages: Derivation trees, Ambiguity in context-free grammars, closure properties of context free languages, Chomsky and Greibach normal forms, Pumping lemma for context –free languages.

UNIT III: **15L**

Pushdown automata: Basic definition, Acceptance by pushdown automata, pushdown automata and context-free languages.
Turing machine: Definitions, representations and acceptability of turing machine, design of turing machine.

UNIT IV: **15L**

Computability: primitive recursive functions, recursive functions, partial recursive functions and turing machine.
Complexity: the classes P and NP, NP complete problems.

Text books:

1. KLP Mishra, N Chandrasekaran: *Theory of Computer Science*, 3rdEdition,Prentice Hall of India (2006).
2. JC Martin: *Introduction to Languages and the Theory of Computation*, Illustrated Edition, Tata McGraw Hill (2003).
3. K.Kamala: *Introduction to formal languages, Automata Theory and Computation*, 1st Edition, Dorling Kindersley(India) Pvt. Ltd., (2009).
4. J Hopcroft& J Ullman: *Introduction to Automata Theory, Languages and Computation*, 3rd Edition, Naroco Publishing House, (2007).

C#. NET: MCA 402

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Basics of .Net framework: .net architecture, Managed and Unmanaged code, Assemblies, Execution of assembly's code, IL, JIT, framework class library, Common Type System, Common Language Specification, Garbage Collector, Global Assembly Cache,

Introduction to C#.Net: Overview of C#, Data Types, Literals, Variables, Operators, Program Control Statements.

UNIT II: **15L**

Introducing classes and Objects: Class fundamentals, object creation, methods, constructors, garbage collection and destructors, new and this keyword

Closer look at method and classes: controlling access to class members, pass reference to methods, returning object and arrays, method overloading, overload constructor, static classes

Arrays and Strings: Arrays- one dimensional and multi dimensional, jagged arrays; Strings – constructing, operating, arrays of strings

Indexers and Properties: Indexers-one dimensional, multi-dimensional, Properties-auto implemented, object initializers

UNIT III: **15L**

Inheritance: Basics, member access, name hiding and constructors with inheritance, virtual methods and overriding, abstract class, preventing inheritance

Interfaces, Structures and Enumerations: Interface – properties, indexers, inheritance, explicit implementations, choosing between interface and abstract class, structures and enumerations

Exception Handling: Exception handling fundamentals, checked and unchecked exception using multiple catch, nested try blocks, throwing an exception, derived exception, using finally.

Delegates, Events, and Lambda Expressions: Delegates- multicasting, covariance and contra variance; Anonymous Function and methods; Lambda Expression-Lambda operator, expression and statement lambdas; Events-using event accessors, miscellaneous events.

UNIT IV: **15L**

Namespaces, the Preprocessor, and Assemblies: Namespace – declaring namespace, additive, nested namespace, global namespace; Preprocessor – different types; Assemblies and internal access modifier

Runtime Type ID, Reflection, and Attributes: Runtime Type Identification-testing a type, using typeof and as; Reflection-using reflection; Attributes-basics

Linq: fundamentals, filter value, sort result, nested from clause, group result, use into and let, anonymous type, group join, query methods, deferred vs immediate query execution, expression tree and methods.

Text Books:

1. Hebert Schildt: *C# 3.0 Complete Ref*erence, McGrawHill (2009).
2. Jeffrey Richter: *CLR via C#,* Microsoft Press, 3rd Edition.
3. Jon Skeet: *C# in Depth*,Manning, 2nd Edition (2010).
4. Jack Purdum: *Beginning Object-Oriented Programming with C#,* 1st Edition (2012).

Computer Graphics & Multimedia: MCA 403

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNITI: **15L**

Introduction, Application areas of Computer Graphics, overview of graphics systems, video display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices **Output primitives:** Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNITII: **15L**

2-D Geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. **2-D Viewing :** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNITIII: **15L**

3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces. Basic illumination models, polygon rendering methods. **3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNITIV: **15L**

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods **Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications **.**

Text Books:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, 3rd edition Pearson education New Delhi 2004 .
2. Computer Graphics Principles & practice in C, Foley, VanDam, Feiner and Hughes, 2nd edition Pearson Education 1996.
3. Computer Graphics Second edition, Zhigand xiang, Roy Plastock, Schaum's outlines,2nd Tata McGraw Hill Publications,2002.
4. "Procedural elements for Computer Graphics", David F Rogers, TataMcGraw Hill, 2nd edition 2001.

Management Concepts & Practices: MCA 404

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Concept and Evolution of Management: Features and Signification of Management, Roles and Responsibilities. The Management Process & Function, History of Management Thought, Theories & Approaches to management.

UNIT II: **15L**

Planning: Characteristics, Significance and Limitations, Purpose and Process of Planning, Types of Managerial Plans, Planning Premises and Forecasting. Decision Making: Fundamentals & Process of Decision Making, Types of Decisions, Techniques of Decision Making, and Limitations of Rational Decisional Making.

UNIT III: **15L**

Organizing: Factors Influencing Organizing, Significance and Common Errors in Organizing, Departmentation, Span of Control, Levels of Organization, Line & Staff Relationship, Delegation and Decentralization. Directing and Leading: Aspects of Directing, Principles of Directing, Leadership-Characteristics, Functions and Styles, Communication: Means, Types and Barriers.

UNIT IV: **15L**

Controlling & Coordinating: Basic Control process, Pre-requisites of Control, Techniques of Controlling, Recent Trends, Co-ordinating: Importance and Principles, External & Internal Co-ordination. Software Industry Environments.

Text Books:

1. Prasad, L. M., Principles & Practices of Management,S. Chand & Sons,7th Edition 2010.
2. Koontz, H. & Weithrich, H., Essentials of Management, McGraw Hill International,Eighth Edition,2009.
3. S. Natarajan,Principle of Management,PHI Learning,First Edition,2009.
4. J.P. Mahajan, Business Organization & Management,International Book House,First Edition,2011.

Information Securities: MCA 405

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT-I: **15L**

Introduction: History, Critical characteristics of information, CNSS security model, Components of an information system, Balancing security and access, The SDLC, The security SDLC.**Need for Security:** Business needs, Threats, Attacks, secure software development.

UNIT-II: **15L**

Legal, Ethical and professional Issues: Law and ethics in information security, Relevant U.S laws- international laws and legal bodies, Ethics and information security. **Risk Management:** Overview, Risk identification, Risk assessment, Risk control strategies, selecting a risk control strategy, Quantitive versus qualitative risk control practices, Risk management discussion points, Recommended risk control practices.

UNIT-III: **15L**

Security Technology- Firewalls and VPNs: Access control, Firewalls, Protecting remote connections.**Security Technology-** Intrusion detection, access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Biometric Access controls.

UNIT-IV: **15L**

Cryptography: Foundations of cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems. **Implementing Information Security:** Information security project management, Technical topics of implementation, Non technical aspects of implementation, Security certification and accreditation.

Text Books:

1. Michel E Whitman and Herbert J Mattord, 'Principles and Practices of Information Security', 4th Ed. Cengage Learning', 2012.
2. Ross Anderson, 'Security Engineering-A guide to building dependable distributed system', 2nd Edition, Wiley, 2008.
3. Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, 1st Ed. Auerbach Publications, 2010.
4. Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes and Practices, 1st Ed. PHI , 2008.
5. Mark Merkow and Jim Breithaupt, Information Security Principle and Practices, 1st Ed., Pearson Education, 2007.

C#.NET Laboratory: MCA 491

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

Lab Experiments

1. Write a program to accept 10 numbers from a form, display the minimum and maximum, odd and even numbers.
2. Write a program to accept text on the form, display alphabets, characters and special characters from the text
3. Write a program to create a form with username and password fields, with login and reset button. Accept a username/password of scott/tiger and display "welcome scott" if valid else show error.
4. Write a program to make use of the built in functions
   a. Display today's date with day, day name , month & year and display the date after 45 days from current date
   b. Accept a date from user, check whether the year is leap or not.
   c. Accept a date, check date validations.
5. Write a program which has two functions rev(a) to reverse a number and srev() to reverse a string. The program will have two textbox for the input and two Rich Textbox for the output. Display the output with different color and fonts.
6. Create a simple calculator which will have basic operations like add, subtract, multiply, divide etc.
7. Design a form with 9 checkboxes from 0 to 9, 3 radio buttons for 3 different colors and one button "Add". After clicking on Add, display the sum of digits selected. If any of the radio button is selected, change the background color with the color selected
8. Design an application with 2 list boxes, with buttons "Transfer one", "Transfer all", "Delete", "Add List 1", "Add List 2". After clicking on buttons transfer either selected items or all items to 2^{nd} list box & vice versa. Add and delete will add additional items to listbox 1 or listbox 2 and delete will delete selected item.
9. Design an application that will set timer interval as 10 and will display any one image of the 2 images. Display a running clock in a text box.
10. Create one MDI form, Add 3 child forms. Design a menu to arrange all the forms in Cascading, tile form. Also design a menu of Edit with Cut, Copy, Paste, select all options. Assign shortcut Keys & hot keys.
11. Write a program to override a method which calculates pay of employees to take bonus into account and also demonstrate boxing.
12. Write a program to demonstrate different kinds of arrays including jagged arrays and create read-only property and write-only property
13. Write a Program to demonstrate that despite of the internal implementation of the class, its data can be obtained consistently through the use of indexers
14. Write a program in C# to demonstrate and verify that the static constructor runs only one time, even though two instances of Class are created, and that it runs before the instance constructor runs.
15. Write a program in C# to show that when a struct is passed to a method, a copy of the struct is passed, but when a class instance is passed, a reference is passed.
16. Write a Program to implement an Interface and also perform conversion between enums and their base types.

17. Write a program to string manipulations and calling methods directly by using delegates and invoke an event when a list of documents is changed.
18. Write a program to display attributes of two classes order and accounts with the implementation of Author attribute class.
19. Write a program in C# to create a base class shape and derived classes i.e., Rectangle, Circle, and Triangle. Invoke the method from base class shape using polymorphism
20. Write a program in C# to open a file to write and read and handle the exception.
21. Write a program to use indexed properties to perform some text operations on object of a class.
22. Write a program in c# to using .NET Framework calls to deny the UnmanagedCode permission i.e. for imperative security and also to use attributes for the security permissions i.e. for Declarative Security.
23. Write a program to implement a collection class used with for each.
24. Write a program to demonstrate database programming using DAO
    a. Display all records of Emp table
    b. Create a search functionality to search for the Employee name and id
    c. Create an application to Add, Delete, Modify employees (using code)
    d. Display all the records in Grid.
    e. Create proper reports using Data/Crystal Reports
25. Write a program to demonstrate database programming using Linq
    a. Display all records of Books table
    b. Create a search functionality to search for the Book name and author
    c. Create an application to Add, Delete, Modify Book (using code)
    d. Display all the records in Grid.
    e. Create proper reports using Data/Crystal Reports

Web Programming: MCA 492

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments: (Using HTML, VBScript, JavaScript)

1. Write html code for Head elements, Paragraph and horizontal link, Line break and HTML formatting text Bold, Italics, Small, Big, Strong, Subscript, Superscript Inserted text, Deleted text.
2. Write HTML code for Computer output tags (all) and HTML citation, quotations and definition tags inside different frames.
3. Write HTML code for image map, lists.
4. Write HTML code for table within tables.
5. Write HTML code for showing the different Doctypes.
6. Write HTML code for head elements and meta and useful character entities.
7. HTML code for three ways of inserting style sheets.
8. Write HTML code to show all attributes and the use for CSS Background and CSS Text, CSS Font and CSS Link, CSS Lists and CSS Tables
9. Write HTML code to show set of 4 different combinations for CSS Box Model.
10. Write html file to show the use of internal and external javascript. Print the words “Hello World” using javascript. Make use of comments
11. Write javascript function which passes a variable and alert a message when a button is clicked <input type=”button” onclick=”mf(‘hello’)” value=”o”>.
12. Write a javascript function to accept two numbers and perform addition, subtraction, multiplication, division and return the result to the main function.
13. Write a JavaScript function to display the current date when a button is clicked and on the onLoad event alert ‘Hello World’.
14. Use JavaScript onchange event for a textbox field , alerting a message when contents of a textbox field is changed.
15. Creating a JavaScript code block, which checks the contents entered in a form’s Text element.If the text entered is in the lower case, convert to upper case.
16. Creating a JavaScript code block using arrays to generate the current date in words(in format :Saturday,January 01,2013).
17. Creating a JavaScript code block, this validates a username and password against hard coded values.
18. Using javascript math function , get a random number (using Math.random()) and convert this number to the range 0 and 10 (using Math.floor()).

19. Write a PHP code for create and display names of Fruit(using an array) and their prices in a Tabular Layout(Using key and value pairs).
20. Write a PHP code for display current date , month ,year and day of the week of the machine serving PHP page.
21. Write a PHP code for create a function to calculate 33% tax on the given salary.
22. Write a PHP code for generate Fibonacci series for the numbers 1 to 29.
23. Write a PHP code for create a form to capture product Details for submitting it and for clearing the data.
24. Create a PHP code , which will retrieve the data capture by the HTML from,display the name of the form and also display the message Data Entered Successfully on the HTML form page after performing the validations.
25. Create a PHP applications (inventory management) which connect with MySQL database and perform create, read, update, and delete operations.

Java Programming: MCA 501

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Java introduction:Features of Java, Basic of OOP,Java Program Structure,Java Virtual Machine,Constants,Variables, and Data Types,Type Casting,Operators and Expressions,Decision Making and Branching.**String Handling,Classes and Objects**: Concepts of classes and objects, method overloading, constructors, constructor overloading,methods and classes, Garbage collector, call by value, call by reference, recursion, nested classes, inner classes.

UNITII: **15L**

Inheritance: Concepts, Composition, difference between inheritances in Java, usage of super keyword, method overloading, abstract classes, dynamic method dispatch.**Packages:**Concepts, Package & import keywords, class path. **Interfaces:**Differences between classes and interfaces, application of interfaces, multiple inheritance in Java.**Exception handling** – concept of Exception handling, types of exceptions, usage of try, catch, throw, throws, finally keywords.

UNITIII: **15L**

Multithreaded Programming: Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization.**Applet Programming:**Introduction, Building Applet Code, Applet Life Cycle, Designing a Web Page, Applet Tag, Adding Applet to HTML File,Passing Parameters to Applets Event Handling.

UNITIV: **15L**

Managing Input/Output Files in Java: Introduction, Concepts of Streams Stream Classes, Byte Stream Classes, Character Stream Classes, using the File Class, Input/Output Exceptions, Creation of Files.**AWT**-AWT classes-Window fundamentals- AWT Controls, Layout Managers andMenus-Labels-Buttons-CheckBoxes-CheckBoxGroup-ChoiceControl-Lists-ScrollBar TextField-TextArea-LayoutManagers-MenuBars and Menus-DialogBoxes-FileDialog.

Text Books:

1. E. Balagurusamy," Programming with Java, A Primer", 3rd Edition, Tata McGraw Hill, New Delhi-2007.
2. Herbert Schildt, "The Complete Reference- Java", 7th Edition, Tata McGraw-Hill Publishing Company Limited: NewDelhi-2006.
3. H.M.Deitel&P.J.Deitel- JAVA- How to Program, 5th Edn, Pearson Education,NewDelhi-2004.
4. *P.Naughton and H. Schildt-JAVA: The Complete Reference, TMH, New Delhi 2005*

Artificial Intelligence: MCA 502

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT- I: **15L**

Intelligent Agents – Agents and environments, Good behaviour, The nature of environments, Structure of agents.

Problem Solving - problem solving agents, example problems, searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.

UNIT- II: **15L**

Informed search and exploration – Informed search strategies, heuristic function, local search algorithms and optimization problems, local search in continuous spaces, online search agents and unknown environments.

Constraint satisfaction problems (CSP) – Backtracking search for CSP, Local search for CSP, Structure of problems.

Adversarial Search – Games, Optimal decisions in games, Alpha-Beta Pruning, imperfect real-time decision, games that include an element of chance.

UNIT- III: **15L**

First order logic – representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic.

Inference in First order logic – propositional versus first order inference, unification and lifting, forward chaining, backward chaining, Resolution.

Knowledge representation - Ontological Engineering, Categories and objects, Actions - Simu lation and events, Mental events and mental objects.

UNIT –IV: **15L**

Learning - Learning from observations, forms of learning, Inductive learning, Learning decision trees, Ensemble learning.**Knowledge in learning**- Logical formulation of learning, Explanation base learning, Learning using relevant information, Inductive logic programming.

Statisical learning methods- Learning with complete data, Learning with hidden variable: EM algorithm, Instance based learning, Neural networks.**Reinforcement learning-** Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach ", Pearson, 3rd Ed.
2. D. W. Paterson, "Introduction to Artificial Intelligence and Expert System", PHI, 2009.
3. George F. Luger, "Artificial Intelligence- Structures and Strategies For Complex Problem Solving", Pearson Education, 5th Ed., 2010.
4. Elaine Rich and Kevin Knight, "Artificial Intelligence ", 3rd Edition, Tata McGraw-Hill, 2009.
5. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis ", 1st Ed. Morgan Kaufmann Publishers, Inc. 1998.

Software Engineering & CASE Tools: MCA 503

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT-I: **15L**

Introduction*:* Evolving role of software, Software Engineering, Changing nature of Software Engineering, Software Myths, Software Processes. **Process Models***:* Prescriptive Model, Waterfall Model, Incremental Process Model, Evolutionary Process Model, Specialized Process Model, Unified Process.

UNIT-II: **15L**

Agile Development*:* Agility, Agile Process, Agile Process Models. **Requirements Engineering***:* Requirement Engineering Task, Requirement Engineering Process, Eliciting Requirements, Building the Analysis Model, Requirement Analysis, Data Modeling Concepts. **Design Engineering:** Design within the Context of Software Engineering, Design Process, Design Concept, Design Model.

UNIT-III: **15L**

Project Scheduling: Basic Concepts, Project Scheduling, Tasks, Scheduling. **Risk Management:** Reactive Vs Proactive Risk Strategies, Software Risk, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring and Management. **Quality Management:** Quality Concepts, Software Quality Assurance, Software Review, Software Reliability, Software Configuration Management, Formal Approaches to SQA.

UNIT-IV: **15L**

Testing Strategies: A strategic approach to Software Testing, Strategic Issues, Test Strategies for Conventional and Object-Oriented Software, Verification and Validation, Validation Testing, System Testing, Black-Box Testing, White-Box Testing, Control Structure Testing, Alpha and Beta Testing, Levels of Testing. **Software Maintenance***:* Software Maintenance, Maintenance Process, Maintenance Models. **Re-Engineering***:* Software Re-Engineering, Reverse Re-Engineering, Re-structuring, Forward Engineering.

Text Books:

1.Pressman Roger S., Software Engineering- A practitioner's approach, 7th Edition, Tata McGraw Hill-2009

2.Aggarwal KK and Singh Yogesh, Software Engineering, 3rd Edition, New Age International Publisher-2008.

3. Jalote Pankaj, An Integrated Approach to Software Engineering, 3rd Edition, Springer-2005.

4.Ghezzi, Jazayeri & Mandrioli, Fundamentals of Software Engineering, 2nd Edition, Prentice Hall-2003.

Minor Project: MCA 591

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

The aim of the Minor Project(s) is to lay a foundation for Major Project to be carried out by the student during 6th Semester of MCA Programme.

- Each student should carry out individually one Mini Project Work and it may be a case study using the software packages that they have learned or may be an implementation of a concept in a paper prescribed on a journal.
- It should be compulsorily done by the student in-house under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
- The mark distribution for Minor Project is 60 external and 40 internal marks
- The Minor Project(s) will be assessed by the concerned supervisor(s) and shall award marks out of 40 for each students as Internal Assessment.

Topics	**Internal Marks**
Attendance	10 Marks
Experiments Assignment	10 Marks
First Internal – Documentation + presentation	10 Marks
Second Internal- Project Demonstration + presentation	10 Marks
Total	**40 marks**

- A candidate is required to present the progress of the project work during the course of the semester at an appropriate time decided by the Department.
- Students can select from the following topics or a topic they desire which should be approved by the supervisor.

No	Topics
1	Design of Application Software.
2	Game Development.
3	Module Development.
4	Add-ons Development.
5	System Software Development.
6	Web Applications Development.
7	Networking Software Development.
8	Mobile Application Development
9	Animation Development

- Students should complete the following experiments and submit it as a part of project report

No	Experiment
1	Phases in software development project, overview, need, coverage of topics
2	To assign the requirement engineering tasks
3	To perform the system analysis : Requirement analysis, SRS
4	To perform the function oriented diagram : DFD and Structured chart
5	To perform the user's view analysis : Use case diagram
6	To draw the structural view diagram : Class diagram, object diagram
7	To draw the behavioral view diagram : Sequence diagram, Collaboration diagram
8	To draw the behavioral view diagram : State-chart diagram, Activity diagram
9	To draw the implementation view diagram: Component diagram
10	To draw the environmental view diagram : Deployment diagram
11	To perform various testing using the testing tool unit testing, integration testing
12	To draw UML diagrams using Rational rose software/Microsoft Visio software

- The synopsis format and project report format should be the same as Major Project documents and should be minimum 40 pages (excluding coding part).

- University Exam will be conducted as like a practical exam with one Internal and one External Examiner, which carries 60 marks which is distributed as below

Topics	**External Marks**
SRS / Synopsis	10 Marks
Diagrams	10 Marks
Database Design	10 Marks
Input-Output Design (Forms / Reports)	10 Marks
Presentation	10 Marks
Viva Voice	10 Marks
Total	**60 marks**

Java Programming Laboratory: MCA 592

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 2 (0-0-3)**

List of Experiments:

1. WAP to add 10 numbers and find the average, maximum and minimum number
2. WAP to show the working of a default constructor, parameterized constructor and overloading constructor
3. WAP to pass parameter using call by value and call by reference
4. WAP to sort a number 1,9,10,13,14,15,20,23,25 using-
   a) Bubble Sort b) Insertion sort c) Selection sort.
5. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1,1. Every subsequent value is the sum of the 2 values preceding it. Write A Java Program (WAJP) that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.
6. WAP to calculate area of square, rectangle, triangle, circle, rhombus using method overloading
7. WAP that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
8. WAP that checks whether a given string is a palindrome or not. Ex: MALAYALAM is a Palindrome.
9. WAP for sorting a given list of names in ascending order.
10. WAP to check the compatibility for multiplication, if compatible multiply two matrices and find its transpose.
11. WAP that illustrates how runtime polymorphism is achieved.
12. WAP to create and demonstrate packages.
13. WAP, using StringTokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
14. WAJP that reads on file name from the user then displays information about whether the file exists, whether the file is readable/writable, the type of file and the length of the file in bytes and display the content of the using FileInputStream class.
15. WAP that displays the number of characters, lines and words in a text/text file.
16. Write an Applet that displays the content of a file.

17. WAJP that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - x / % operations. Add a text field to display the result.
18. WAP for handling mouse events.
19. WAP demonstrating the life cycle of a thread.
20. WAP that correctly implements Producer-Consumer problem using the concept of Inter Thread Communication.
21. WAP that allows user to draw lines, rectangles and ovals.
22. WAP to generate a set of random numbers between two numbers x1 and x2, and x1>0.
23. WAP to implement a Queue, using user defined Exception Handling (also make use of throw, throws).
24. WAP that creates 3 threads by extending Thread class. First thread displays “Good Morning” every 1 sec, the second thread displays “Hello” every 2 seconds and the third displays “Welcome” every 3 seconds. (Repeat the same by implementing Runnable)
25. With a sample java code explain the method of creating and executing an Applet?
26. Write an Applet to receive the value of the parameter message from the html file and display it on the webpage?
27. Write a java code to explain the concept of Label ,Buttons ,Text fields ,Text Area ,Checkbox Checkbox group List Choice control Scrollbars control in AWT?
28. Write a java code to draw horizontal, vertical and diagonal lines by making use of graphics methods?
29. Write a java code to display the text “NIELIT” in various Colors?
30. Write a java code to explain the concept of Flow Layout ,Border Layout , Grid Layout, Card Layout GridBag Layout in AWT.
31. Write a java code to explain JText field JButton JCheckBox, JRadioButton JComboBox JTabbedPane control in Swings.

ELECTIVE I

Advanced Computer Networks : MCA 521

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Introduction: Overview of OSI and TCP/IP protocol suite, Wired LAN, Wireless LAN, Point-to-point WANS, Switched WANS.

Network Layer: Introduction, IPv4 overview, **Mobile IP-** addressing, agents, three phases. **Unicast Routing protocols-** RIP, OSPF, BGP. **Unicast and Multicast Routing protocols-** introduction, multicast address, IGMP, multicast routing, routing protocols.

UNIT II: **15L**

Transport Layer: transport layer services, **UDP-** introduction, services, applications, package. **TCP-** services, features, segment, connection, flow control, error control, congestion control, timers, package. **SCTP-** Introduction, services, features, packet format, flow and error control, congestion control.

Multimedia: Digitizing Audio and Video, Audio and Video Compression, RTP, RTCP, Voice over IP, Quality of service, Integrated Services.

UNIT III: **15L**

IPv6: IPv6 addressing- Introduction, address space allocation, Global Unicast Address. **IPv6 protocol-** packet format, transition from IPv4 to IPv6.

ICMPv6- Error messages, Informational messages, Neighbor-discovery messages, Group membership messages.

Application Layer: Introduction, Client-server, peer-to-peer, DHCP, DNS, TELNET, FTP, TFTP, SNMP.

UNIT IV: **15L**

Cryptography: Traditional and modern cipher, Assymetric-Key Ciphers, Message Integrity, Message Authentication, Digital Signature, Key management.

Internet Security: Network Layer Security, Transport Layer Security, Application Layer Security, Firewalls.

Text Books:

1. Behrouz A. Forouzan, 'TCP/IP protocol suite' 4th Edition, Tata McGraw Hill, 2010.
2. Douglas E. Comer, 'Internetworking with TCP/IP-Principles, protocols and architectures' 4th Edition, Prentice Hall, 1995.
3. Behrouz A. Fourouzan, 'Data Communication and Networking, Tata McGraw Hill', 4th Ed., Tata McGraw Hill, 2007.
4. Andrew S. Tanenbaum, Computer networks, 4th Edition, Pearson Publication, 2003.
5. Alberto Leon- Garcia and Indra Widjaja, Communication Network Fundamental Concepts and Key Architectures, 2nd Ed., 2001, Tata McGraw Hill

Digital Image Processing: MCA 522

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Image representation and modeling: Enhancement, restoration, Image analysis and reconstruction, image data compression, two dimensional systems, linear systems and shift invariance, Fourier transform, Z-transform, Block matrices and Kronecker products, Random signals.

UNIT II: **15L**

Image perception: Introduction, light, luminance, brightness and contrast, MTF of the visual system, visibility, function, monochrome vision models, color matching and reproduction, color vision Model, Image sampling and quantization, two dimensional sampling theory, reconstruction of images from its samples, Nyquist rate, aliasing, sampling theorem, Practical limits in sampling reconstruction, Image & visual quantization.

UNIT III: **15L**

Image transforms: Two dimensional orthogonal and unitary transforms, properties of unitary transforms, one dimensional DFT, cosine, sine Harmed and Haar transforms.
Image Enhancement: Point operations, contrast stretching, clipping and thresholding, digital negative intensity level slicing, bit extraction, Histogram modeling, histogram equalization, modification, spatial operations, smoothing techniques, Magnificent and interpolation, Transform Operations, Color image enhancement.

UNIT IV: **15L**

Image analysis and computer vision: Spatial feature extraction, transform features, Edge detection, gradient operators, compass operators, stochastic gradients, line and spot detection.

Text Books:

1. Jain Anil K, Fundamentals of Digital Image Processing, 7th Edi.,Prentice Hall, 2001.
2. Gonzalez Rafael C, Digital Image Processing 1st Edi., Pearson Education India, 2009.
3. Annadurai S., Fundamentals of Digital Image Processing, 1st Edi., Pearson Education India, 2007.
4. Pratt William K, Digital Image Processing, 4th Edi., John Wiley and Sons, 2007.

Distributed and Parallel Computing: MCA 523

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Introduction to parallel processing: parallel architecture, systolic and associative array, SISD, MIMD etc, data flow architecture, subsystems bandwidths, inter-processor communication, shared RAM, interconnection network.

UNIT II: **15L**

Systolic array: cross-bar and ring network, multi-stage network, dynamic communication
Parallel algorithms: sorting FFT, matrix operation, and graph algorithm.

UNIT III: **15L**

Introduction to distributed computing: distribution of data and control, synchronization, distributed termination problem, load distribution, deadlocks in distributed systems.

UNIT IV: **15L**

High level language support in distributed computing: message passing primitives, atomic action, remote procedure call mechanisms, case study of some languages like OCCAMII, LINDA.Formal development and verification of distributed algorithms.

Text Books:

1. J P Hayes, Computer Architecture and Organization, 3rd Edi., MGH, 1998.
2. Andrew S. Tanenbaum, Distributed Systems: Principles and Paradigms, 2nd Edi., Pearson Prentice Hall, 2007.
3. T. J. Fountain, Parallel Computation: Principles and Practice, 1st Edi., Cambridge University Press, 2006.
4. Moreshwar R. Bhujade, Parallel Computing, 1st Edi., New Age International, 1995.

Pattern Recognition: MCA 524

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Introduction to pattern recognition, Pattern recognition system: pattern classification, preprocessing, segmentation, feature extraction, post processing, feature space, classifier, learning and adaptation, supervised and unsupervised learning.

UNIT II: **15L**

Statistical approach to pattern classification: Bayesian decision theory, priori probability, posteriori probability, likelihood ratio, continuous features, two category classification, minimum error rate classification, normal density, univariate density, multivariate density, Bayer's decision for discrete features, missing and noisy features.

UNIT III: **15L**

Maximum likelihood estimation: expectation maximization EM, maximum likelihood estimation, parametric and nonparametric estimation, Hidden Markov Model (HMM).

UNIT IV: **15L**

Non-parametric decision-making: K-nearest neighbor classification technique, Parzon window estimator, adaptive decision boundary, and Fuzzy classification. Unsupervised learning and clustering technique for classification: hierarchical clustering, single linkage algorithm, complete linkage algorithm, partial clustering, K-means algorithm.

Text Books:

1. Duda, Hart, Stork, Pattern Classification, 2nd Edi., John Wiley & Sons, 2012.
2. Amita Pal, S K Pal, Pattern Recognition, Illustrated Edi., World Scientific, 2001.
3. B. Chanda, D Dutta Majumder, Digital Image Processing, 2nd Edi., PHI, 2011.
4. TheodoridisS., Pattern Recognition, 4th Edi., Academic Press, 2008.

ELECTIVE II

Embedded Systems: MCA 531

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Overview of Embedded Systems: Introduction, Optimizing Design Metrics, Market Design metric, NRE and Unit Cost Design Metric, Performance Design Metric

Processor Technology: General Purpose, Single Purpose, Application Specific, Full Custom, Semicustom and PLD.

UNIT II: **15L**

Design Technology: Moore's Law, compilation/synthesis, Libraries/IP, Test/verification, More productivity improvers, trade-offs, Design productivity Gap, Mythical man-month

UNIT III: **15L**

Embedded Peripherals: Timers, counters, watchdog timers, reaction timer, ATM timeout using watchdog timer, UART, real time clock

Embedded System Software: Program Optimization, Concurrent Programming, Real-time Scheduling and I/O management.

UNIT IV: **15L**

Networked Embedded Systems: DMA I/O and the ISA Bus Protocol, Multilevel Bus Architectures, parallel and serial communication, wireless communication, Layering, I^2C, CAN, FireWire, USB, PCI Bus, ARM bus,IrDA, Bluetooth.

Text Books:

1. Vahid Frank/Givargis Tony, Embedded System Design, 2nd Edition, Wiley Student Edition, 2002
2. Heath Steve, Embedded System Design, 2nd edition, Prentice Hall of India, 2002
3. Raj Kamal, Embedded Systems: Architecture, Programming, and Design, 3rd edition, Tata McGraw Hill, 2003
4. Prasad, Embedded Systems/Real time Systems, 2nd edition, Prentice Hall India, 2003

Mobile Computing: MCA 532

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Basics of Mobile Technology, cellular concept, operation procedure, cell cluster, circuit switch, packet switch, mobile station (MS), base station (BS), Mobile switching center (MSC), frequency reuse, Handoff, cell splitting, Cell sectoring, umbrella cell concept, microcell zone concept, co-channel interference, paging system, codeless telephone system.

UNIT II: **15L**

Digital mobile system: GSM, CDMA, WCDMA, GPRS, EDGE, HSCSD, iDEN, CDPD
Multiple access techniques: CDMA, TDMA, FDMA, FHMA, SDMA

UNIT III: **15L**

Propagation mechanism, Brewster angle, 2-ray model, Fresnel zone geometry, knife-edge diffraction model, multiple knife-edge diffraction model, Longley rice model, Durkin's model, O-kumara model, Long distance path model, Doppler shift.

UNIT IV: **15L**

Satellite mobile communication: Orbital mechanics: GEO, MEO, LEO system, Spread spectrum communication: definition, types, pseudo-noise sequences, direct sequence spread spectrum (S-SSS), frequency hop spread spectrum (FHSS), performance of DSSS and FHSS.

Text Books:

1. William CY Lee, Wireless and Cellular Communication, 1st Edition, Tata Mc Graw Hill, 2006
2. Black U D, Data Communication and Distributed Networks, 3rd edition, Prentice Hall India. 1995
3. Comer, Computer Networks and Internets, 5th editon, Prentice Hall India.2005
4. Tanenbaum, Computer Networks, 5th edition, Prentice Hall India, 2010

Signal Processing and Applications: MCA 533

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Introduction: Concepts of Signal, Overview of digital signal processing. **Discrete:** Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system. Classifications of sequence, recursive and non-recursive system.

UNIT II: **15L**

Mathematical operations on sequences: Convolutions, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems,

Z-transform: Definition, relation between Z transform and Fourier transform of a sequence, properties of Z transform, mapping between S-plane and Z-plane. Unit circle, convergence and ROC, Inverse z-transform, solution of difference equation using the one sided Z-transform.

UNIT III: **15L**

Discrete Fourier transforms: Definition, IDFT Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, FFT, FFT algorithm, Radix 2 algorithm. Decimation-in-time & decimation-in- frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm.

UNIT IV: **15L**

Digital filter realization: Principle, structures of all-zero filters. Design of FIR filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman. Design of IIR from analog filters. Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimization method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples.

Text Books:

1. L.R. Rabiner & B.Gold, Theory and Application of Digital Signal Processing, 2nd edition, Prentice Hall of India1997.
2. Proakis & Manolakis, DSP, Principles, Algorithms and Applications, 3rd edition, PHI/Pearson. 1997
3. Babu R, Digital Signal Processing , 4th edition, Scitech.2001
4. S. Salivahanan et al, Digital Signal Processing, 2nd edition, Tata Mc Graw Hill.2002

Cellular & Satellite Communication: MCA 534

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Orbital Aspects of Satellites: Orbital mechanics; LEO, MEO and GEO Orbital elements; Look angle; Orbital perturbations; Orbital effects in communication systems performance; Launches and Launch vehicles; Mechanics of launching a geostationary satellite, ELV, STS.

Spacecraft's: Spacecraft subsystems; TAT & C; AOCS; Power systems; Spacecraft antennas; Equipment reliability. **Satellite Communication Links:** Design of satellite links; Direct Broadcast Satellite receiving systems, Earth station design; VSAT.

UNIT II: **15L**

Modulation and Multiplexing Techniques for satellite Links: Analog telephone transmission; Analog TV transmission, Digital transmission of voice and TV; Bandwidth compression; FM, FDMA and CDMA; SPADE; DAMAS.

UNIT III: **15L**

Global Positioning System: Basic principle of position fixing with GPS; Errors in position fixing; DGPS; WAAS; GPS applications. **Propagation Effects on Satellite-Earth Path:** Attenuation; Doppler shift; Faraday rotation and Depolarization; Scintillation; Multi-path effects; Rain and Ice effects; Alleviating propagation effects.

UNIT IV: **15L**

Cellular Communication System: Characteristics, Comparison with other system, Implementation feasibility, User-friendly Cellular systems, Application areas, Issues in implementation, Present trends.

Text Books:

1. Tri T. Ha, Digital Satellite Communication, 2nd edition, McGraw Hill.2010
2. William Lee, Mobile Cellular Telecommunication, 2nd editon,Tata Mc Grow Hill.2006
3. Singhal, Wireless Application protocol: Writing application for Mobile Internet.1st edition, Addison Wesley Longman 2002
4. D. C. Agarwal, Satellite communication, 2nd edition, Khanna Publishers.2003

Data Warehousing & Mining : MCA 601

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I : **15L**

Data Mining: Basic concept, technology and rules, platform tools, operational vs. Information systems, discussion of ethics & privacy issues with respect to invasive use.

Data mining techniques: Exploration of data mining methodologies, decision tables, Decision trees, classification rules, association rules, clustering, statistical models & linear models.

UNIT II : **15L**

Web mining: Introduction to web mining techniques, web basics and HTTP, data Sources on the web, personalization, working with logs, forms and cookies, user identification and path analysis.

UNIT III: **15L**

Data warehousing: Introduction, scope, practical implications, structures and Functions, Types of data warehouses: Host based, single stage, LAN based, multistage, stationary, distributed and virtual data warehouses.

Data warehouse: The building Blocks- Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse.

UNIT IV: **15L**

Principles of dimensional modeling: Objectives, From Requirements to data design, the STAR schema, STAR Schema Keys.

Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables.

Text Books:

1. Paulraj Pooniah, Fundamentals of Data Warehousing, 1st Edi., John Wiley & Sons. 2009.
2. Sam Anahory, Data Warehousing in the real world: A practical guide for building decision support systems, 4th Edition, John Wiley, 2009 .
3. Jiawei Han, Data Mining: Concepts and Techniques, 3rd Edition, Elsevier Inc.,2012.
4. W. H. Inmon, Building the operational data store, 2nd Ed., John Wiley,1999.

Operations Research: MCA 602

Marks Scale : 100 marks (End Sem. Exam : 60, Int. : 40) **Credits: 4 (3-1-0)**

UNIT I: **15L**

Linear Programming Problems – Definition of LPP, Graphical Solution of Linear Programming Problem ,Artificial Variable Method ,Two Phase Method , Simplex Method, Duality Method, Dual Simplex Method .

UNIT II: **15L**

Transportation Problems: Introduction to Transportation Problem ,Matrix form of TP ,Applications of TP ,Solution Techniques of TP, Different Method for obtaining Initial Basic Feasible Solution viz. Matrix Minima Method ,Row Minima Method ,Column Minima Method ,Vogel's Approximation Method.

Assignment Problems: Definition, Hungarian Method for AP.

UNIT III: **15L**

Network Optimization Models- The shortest path problem, Minimum Spanning Tree Algorithm, Maximal Flow Algorithms, PERT/ CPM.

Dynamic Programming- Characteristics, Deterministic & Probabilistic Dynamic Programming.

Queuing Theory- Introduction to Queues , Basic Structure of Queuing Models, Exponential distribution, Birth-and-Death Model, M/M/I Queue.

UNIT IV: **15L**

Inventory Model: Inventory models-Various Costs deterministic inventory models ,Single period inventory model with shortest cost, stochastic models ,Application of inventory models ,Economic lot sizes-price breaks.

Game Theory-Two person Zero Sum game, saddle point determination, algebraic method, graphical method etc.

Text Books:

1.Kanti Swaroop, Operation Research.
2.V K Kapoor, Operation Research.
3.Paneer Selvam, Operation Research, PHI.
4.Hillier & Lieberman, Operations Research, TMH.

Major Project: MCA 691

Credits: 24 (4P)
Full Marks: 500

The primary objective of Major Project basically for the implementation of the various technologies learned during all the 5 semesters in the real life scenario.

It is oriented towards developing skills, knowledge, and attitudes needed to make an effective start as a member of the computer, IT profession. The students will be doing projects relating to the different specialization areas.

- Project work may be done individually or in groups not more than 3 in case of bigger projects.
- It can be done by the student in-house or in companies/institutions/colleges/offices under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
- The mark distribution for Major Project is 300 external and 200 internal marks
- The Major Project(s) will be assessed by the concerned supervisor(s) and shall award marks out of 400 for each students as Internal Assessment.

Topics	**Internal Marks**	**Deadline**
Synopsis submission	25 Marks	3rd Week
SRS + Design document submission + presentation	25 Marks	7th Week
Coding Submission	25 Marks	11th Week
Testing document submission	25 Marks	14th Week
Final report documentation submission + software	50 Marks	19th Week
Final demonstration + presentation	25 Marks	20th Week
Project complexity + methodology used+ timely submission + coding standards	25 Marks	
Total	**200 marks**	

- A candidate is required to present the progress of the project work during the course of the semester at an appropriate time decided by the Department.
- Students can select from the following topics or a topic they desire which should be approved by the supervisor.

No	**Topics**

1	Design of Application Software.
2	Game Development.
3	Module Development.
4	Add-ons Development.
5	System Software Development.
6	Web Applications Development.
7	Networking Software Development.
8	Mobile Application Development
9	Animation Development
10	RDBMS Software Development
11	Cloud Computing
12	Grid Computing
13	Data Mining

- The synopsis format and project report format is given as annexure and should be minimum 90 pages (excluding coding part)
- University Exam will be conducted as like a practical exam with one Internal and one External Examiner, which carries 300 marks which is distributed as below

Topics	**External Marks**
Synopsis	25 Marks
SRS	25 Marks
Diagrams	25 Marks
Database Design	25 Marks
Coding Standards	25 Marks
Input-Output Design (Forms / Reports)	25 Marks
Project complexity + applicability	25 Marks
Project Report	25 Marks
Presentation	50 Marks
Viva Voice	50 Marks
Total	**300 marks**

Guidelines for Documentation for Minor and Major Project

Synopsis Format

1. Title page
   a. Student's name and registration number
   b. Course and Session
   c. Propose Project Topic
   d. Name of company/department/college etc. where project will be done
2. Brief Introduction to Project (may not exceed 3 pages)
3. Design of solution (may not exceed 3 pages)
4. Methodology / Planning of work (may not exceed 3 pages)
5. Facilities provided for the proposed work

Project Documentation Format

Basic format guidelines

a. Times New Roman 12-point font
b. 1-inch margins (top, bottom, left and right)
c. Do not justify text; use left alignment except for the cover sheet
d. Single-spaced text
e. Clearly label in **bold** any tables, graphs or charts used. *Example:* **Table 3a**
f. Section headings in **bold** on separate lines from the text body
g. Each page (except the title page) includes a page header. The header should show: project leader's last name, et al. (meaning "and the others"). *Example:* Jamison, et al.

h. Each page also includes a footer. The left footer shows the version and date revised and the right footer shows the section #, subsection #, and page number. (Guidelines for versions and page numbers are given later in this document.)
i. The first time an acronym is introduced in the text, it should be spelled out in its entirety.

Guidelines for Versions

a. When a document is first written, it is said to be created on that date, and its version number is 0.0
b. Major Revision (Version # increases by 1): any revision of a document that adds to, subtracts from, or alters the content or meaning of the document.
c. Minor Revision (Version # increases by .1): any revision of a document that changes its form without altering the content or meaning. Minor revisions include grammar and spelling corrections and reorganizations.
d. The final version of each document (each main section) will be submitted. However, in the project appendices, an index showing all versions and their revision dates will be shown

Guidelines for Page Numbers

a. The page numbering scheme for the project is based on sections and subsections.
b. Each subsection will be individually page-numbered
c. Each page number will consist of three parts: the main section, the subsection, and the page.

   In the Project Management section (the first main section of the project) the project scope and objectives section (second subsection) is two pages long. Its page numbers are 1.2.1 and 1.2.2.
d. To number pages in the appendices, substitute the appendix letter for the main section number.

   If Appendix A (the Glossary) has three pages, they should be numbered A.1, A.2, and A.3
e. To number the Title Pages and Table of Contents page(s) simply use lower-case roman numerals (the Title Pages should be numbered: i, ii; the Table of Contents: iii, iv, etc.)

Title Page

a. It should include project title (underlined)
b. It should be single space and center-aligned
c. It should include the session also

Project Management Plan

The management plan defines the purpose of the project and its organization. It should include a subsection for each of the listed topics and others as necessary.

a. Overview the project (general explanation)
b. Project scope and objectives
   -What is the project team responsible for producing? By what time?
c. Assignment of Roles and Responsibilities
   -identification of different roles, definition of responsibilities for each role
d. Project Schedule

-Timelines for each phase, will include work activities and milestones, as well as completion dates of those milestones

Requirements Specifications

This section will consist of a requirements document outlining the system services to be delivered

a. Methods to be used in this project
b. Programming Environment
c. Requirements to run the application

Analysis

This section will document your analysis model. It should include (but is not limited to) material covering items listed below

a. An introduction that includes a description of the problem
b. Use case diagrams
c. Use case description
d. Entity Relationship Diagram
e. Data Flow Diagram

Design

This section will document your design model. It should include (but is not limited to) material covering items listed below

a. Architecture design and interface design
b. A specification view of the Class Diagrams that shows the most important services provided
c. Modularization details
d. Class descriptions (one for each Class) that provide an explanation of the class diagram
e. Data Members for each Class (Describe what information they contain.)
f. Member Functions for each Class; i.e., a logical description of what the functions do
g. Collaboration and sequence diagrams
h. User interface design
i. Database Design

Implementation

This section will document your implementation model. It should include (but is not limited to) material covering items listed below

a. Coding standards employed
b. Comments and description of coding segments
c. Error handling mechanisms
d. Validation checks
e. Execution instructions and machine/system configuration used
f. Notice of code changed/added from the previous product, with reference to which requirement(s) is being met

Test Documentation

This section will document the testing procedures used and their results

a. It will include test plans, test cases, and a log of the results.
b. Test plans and test cases should illustrate that requirements have been met and that the design will work.
c. Logs should show supplied inputs, expected outputs, and how actual outputs are compared with the expected outputs, in order to determine whether a test passes or fails.

Appendix A: Glossary

a. All terms used in the body of your text that could be ambiguous or unclear to the reader should be defined here (For example, you should define terms such as “failure” and “verification.”)
b. Acronyms should also be listed with their definitions.

Appendix B: Source Code

a. A complete copy of your source code should be attached.
b. The code document should follow its own requirement.

Appendix C: Version Index

a. As explained under the guidelines for versions, this is a list of all version numbers and revision dates for each main section.

Appendix D: References

a. Include a bibliography of resources consulted and/or cited in completion of this project. Don’t forget to reference any graphics from online sources. Use the citation format provided in the class guideline for writing assignments.

Appendix E: Progress reports

a. Should be a list containing at what date/time different parts of the project is finish.

Drawbacks and Limitations

This section will describe the drawbacks and limitation of the project.

Conclusions

This section will describe the conclusion of the project.