KANNUR UNIVERSITY

(Abstract)

M.Sc. Computer Science & MCA programme under – Choice Based Credit Semester System-Modified Scheme, Syllabus -Implemented with effect from 2013 admission-Orders issued.

ACADEMIC BRANCH

U.O.No.Acad/C4/10429/2012 Dated, Civil Station (P.O), 04-03-2015

Read: 1.U.O No.Acad/C3/2049/2009, dated 11.10.2010

2.U.O.No.Acad/C3/2049/2009 dated 05.04.2011

3. Minutes of the meeting of the Department Council held on 28/05/2013

4. Letter No. Nil dated 2/12/2013 from HOD, Dept. of Information Technology, Mangattuparamba Campus.

ORDER

1. The Regulations for Post Graduate Programmes Under Choice Based Credit Semester System were implemented in the University with effect from 2010 admissions as per the paper read (1) above and certain modifications were effected to the same vide paper read (2).

2. The Department Council as per paper read (3) above approved the modified Scheme and Syllabus for M.Sc. Computer Science and MCA under choice based credit semester system for implementation with effect from 2013 admission.

3. The head of the Department, Department of Information Technology, vide paper (4) has forwarded the modified Scheme and Syllabus for PG Programmes in M.Sc Computer Science and MCA in line with the Choice Based Credit Semester System for implementation with effect from 2013 admission.

4. The Vice-Chancellor, after considering the matter in detail, and in exercise of the powers of the Academic Council, conferred under Section 11 (1) of Kannur University Act, 1996 and all other enabling provisions read together with, has accorded sanction to implement the Modified Scheme, and Syllabus for PG programmes M.Sc. Computer Science and MCA Under Choice Based Credit Semester System with effect from 2013 admission subject to report Academic Council.

5. Orders are, therefore, issued accordingly.

6. The Modified Scheme and Syllabus appended.

Sd/-

DEPUTY REGISTRAR (ACADEMIC)

For REGISTAR

(PTO)

To:

The HoD, Dept. of Information Technology
Mangattuparamba Campus.

Forwarded by Order

SECTION OFFICER

Copy to:

1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/PA to Registrar/PA to CE
3. DR/AR-I (Academic).
4. SF/DF/FC

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

- *For more details log on to www. kannur university.ac.in*

Kannur University

Department of Information Technology

Master of Computer Applications

(Choice Based Credit Semester System)

Regulations, Curricula, Syllabus and Scheme of Evaluation

(With Effect from 2013 admission)

REGULATIONS

1. **Programme Duration** of the MCA programme shall be 3 years, divided into 6 semesters. Each semester should have 18 weeks. The entire period of the sixth semester shall be devoted for a Major project work.

2. **Selection** will be based on Entrance examination conducted by the University. The university level Entrance examination will consist of questions from the following:
   i. *Mathematics* : 50%
   (Syllabus : Set theory, Propositional Logic, Boolean Algebra, Linear Algebra, Coordinate Geometry and Conic Section, Trigonometry, Matrices, Vectors, Linear Programming, Differential Calculus, Integral Calculus, Series and Sequences, Real and Complex numbers, Polynomials, Permutations & Combinations and Elementary Probability theory.)
   ii. *Aptitude and Mental ability* : 50%

3. Eligibility for admission: Bachelors Degree in any discipline of this University or any other degree of other University / Institution recognized by this University as equivalent thereto with a minimum of 50% marks in optional main subjects and mathematics as one of the subject at least at Higher secondary level. Candidates studying in the final year / semester of their qualifying degree and have successfully cleared all the papers of their previous years / semesters may appear for the entrance examination. Such candidates, if selected, will be admitted only on producing the qualifying degree mark-list.

4. Programme Structure

4.1 **Attendance*:*** The minimum attendance required for each course shall be 75% of the total number of classes conducted for that semester. Those who secure the minimum attendance in a semester alone will be allowed to register for the End Semester Examination. Condonation of attendance to a maximum of 10 days in a semester subject to a maximum of two spells within a programme will be granted by the Vice-Chancellor. Benefit of condonation of attendance will be granted to the students on health grounds, for participating in University Union activities, meetings of the university bodies and participation in extracurricular activities on production of genuine supporting documents with the recommendation of the Head of the Department concerned. A student who is not eligible for condonation shall repeat the course with the subsequent batch.

4.2 ***Courses:*** The MCA Programme shall include three types of Courses, namely, Core Courses (C), Elective Courses (E) / Open Courses (O). The Parent Department shall offer the Core Courses. Elective / Open courses are offered either by the parent department or by any other department.

4.3 ***Credits:*** One credit of the course is defined as a minimum of one hour lecture or a minimum of 2 hours lab/tutorial per week for 18 weeks in a Semester. The total minimum credits, required to complete MCA programme is 120 in which minimum credits required for core courses is 90 and for Elective courses is 18. No regular student shall register for more than 24 credits and less than 12 credits per semester.

4.4 ***Duration:*** The MCA. Programme shall be completed within a minimum of six and maximum of twelve consecutive semesters. If a student does not pass a course within the regular schedule, he/she shall reappear for the course examination along with the subsequent batch.

4.5 Project:

Mini Project: Mini project should be carried out during the fifth semester along with other papers. The project will be carried out in the Department under the guidance of a faculty member. A Departmental committee duly constituted by the Head of the Department will review the project periodically. The continuous assessment (CA) shall be based on the periodic progress and progress report and will be evaluated by the committee. Every student should do the mini project individually and no grouping is allowed. Project report should be submitted for end semester evaluation. Evaluation for ESA shall be conducted by a board of two examiners (Mark distribution: Content 30% + Methodology 30 % + Presentation 20 % + Viva- voce 20 %).

Major Project : The Major project work should be carried out over the entire period of the final semester in the Department /Institution or in an CMM or higher level certified Industry / R & D organization of national repute. Project work shall be carried out under the supervision of a Teacher of the Parent Department concerned prescribed by the Department Co-ordinator. If the project is carried out in an Industry / R & D organization outside the campus, then a co-guide shall be selected from the concerned organization. If the project work is of interdisciplinary in nature, a co-guide shall be taken from the other department concerned. Every student should do the Project individually and no grouping is allowed. All the candidates are required to get the approval of their synopsis and the guide before commencement of the project from the Department. A co-guide should be a postgraduate in CS or allied subject or a person of eminence in the area in which student has chosen the project. A Departmental committee duly constituted by the Head of the Department will review the project periodically every month. The Continuous Assessment marks (CA) will be based on the periodic progress and progress report. At the end of the semester the candidate shall submit the Project report (two bound copies and one soft copy) duly approved by the guide and co-guide for End Semester Evaluation. The project report shall be prepared according to the guidelines approved by the University. A board of two examiners appointed by the University should conduct evaluation for ESE. (Mark distribution: Content 40% + Methodology 20 % + Presentation 20 % + Viva- voce 20 %).

4.6 Seminar: Each student should select a relevant topic and prepare a seminar report,

under the guidance of a faculty member. Students should prepare an abstract of the topic and distribute it to every faculty member at least two days ahead of the seminar. Presentation shall be for a minimum of one-hour duration. Presentation and seminar report will be evaluated by a group of at least three faculty members (Mark distribution: 50% for report and 50% for presentation and discussion).

5. Evaluation of the students shall be done by the faculty member who teaches the course on the basis of continuous evaluation and End Semester Examination. The proportion of the distribution of marks among ESE and CE shall be 60:40. For seminar, 100% weightage shall be given to CE.

5.1 Continuous Evaluation (CE): Continuous Evaluation (CE) of a course shall be based on periodic written tests, assignments, and Seminar / Viva-voce / Case studies in respect of theory courses and record and test/viva in respect of practical courses. The marks assigned to various components for CE for theory and practical is as follows:

Components of Continuous Evaluation (Theory)

	Component	**Marks** (Max 40)
a.	Test papers	16
b.	Assignments	8
c.	Seminar / viva –voce / Case studies / Lab assignments	16

Components of Continuous Evaluation (Practical)

Component	**Marks (Max 40)**
a. Record	10
b. Test / Viva	30

5.2 Assignments : Each student shall be required to submit a minimum of two assignments for each course. The details such as number of assignments, mark distribution and Weightage for each assignment will be announced by the faculty in charge of the course at the beginning of the semester.

5.3 Tests : A minimum of two class tests will be conducted for each course. The details such as number of tests, mark distribution and Weightage for each test will be announced by the faculty in charge of the course at the beginning of the semester.

5.4 **Seminar / Viva-voce / Case studies / Lab assignments** : The faculty in charge of the course shall design the evaluation pattern based on one or more of these components and will be announced at the beginning of the semester.

5.5 **Evaluation of Practical courses**: The details regarding the CE as well as ESE for each practical course will be specified as part of the syllabus for the course.

5.6 End-Semester Evaluation (ESE): The End-Semester Evaluation in theory as well as practical courses for the first five semesters will be conducted by the department. The end semester examination for the final semester will be conducted by the Controller of examination. Duration of all ESE (theory) shall be three hours. Pattern of double valuation will be followed for all theory courses.

5.7 PATTERN OF QUESTIONS : Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. Question paper for end semester theory examination shall consists of :

i. Short answer type : 10 questions (two from each module) x 2 marks

ii. Essay type : 5 questions (one either –or question from each module) x 8 marks

6. Grading:

6.1 An alphabetical grading system shall be adopted for the assessment of student's performance in a course. The grade is based on a ten-point scale. The following table gives the range of marks, grade points and the alphabetical grade.

Range of marks %	Grade points	Alphabetical grade
90 – 100	9	A+
80 – 89	8	A
70 – 79	7	B+
60 – 69	6	B
50 – 59	5	C
<50	0	F

6.2 A minimum of grade point 5 (Grade C) is needed for the successful completion of a course.

6.3 Performance of a student at the end of each semester is indicated by the Grade Point Average (GPA) and is calculated by taking the weighted average of grade points of the courses successfully completed. Following formula is used for the calculation. The average will be rounded off to two decimal places.

$$GPA = \frac{\text{Sum of (grade points in a course multiplied by its credit)}}{\text{Sum of credits of courses}}$$

6.4 The overall performance of a student is indicated by the Cumulative Grade Point Average (CGPA) and is calculated using the same formula given above.

6.5 Empirical formula for calculating the percentage of marks will be **CGPA x 10 + 5**

6.6 Based on CGPA overall letter grade of the student shall be in the following way.

CGPA	Overall letter grade
8.5 and above	A+
7.5 and above but less than 8.5	A
6.5 and above but less than 7.5	B+
5.5 and above but less than 6.5	B
4.5 and above but less than	C

6.7 Conversion of Grades into classification

Classification	Overall letter grade
First Class with distinction	*A+ and A*
First Class	*B+ and B*
Second Class	*C*

6.8 Supplementary Examinations for Failed Candidates:

i) Candidates who have failed (F grade) in the semester examinations (except project work) can appear for the failed papers for the particular semester along with regular students. However, the Continuous Assessment (CA) marks shall remain the same. Two such supplementary chances will be given for each semester within two years.

ii) In the event of failure in Project Work the candidate shall re-register for project work, redo the project work and resubmit the project report afresh for evaluation. The Continuous Assessment marks shall be freshly allotted in this case.

6.9 Appearance for continuous Evaluation and End Semester Evaluation are compulsory and no grade shall be awarded to a candidate if he/she is absent for CE/ESE or both.

6.10 A student who fails to complete the programme / semester can repeat the full programme / semester once, if the department council permits so.

6.11 There shall be no provision for improvement of CE or ESE.

6.12. No student shall be allowed to take more than twelve consecutive semesters for completing MCA programme from the date of enrolment.

7. Grade Card : The Controller of Examination shall issue the consolidated grade statement and certificates on completion of the programme, based on the authenticated documents submitted by the Head of the Department. Grade cards of all semesters other than the final semester will be issued by the Head of the Department.

8. Grievance Redressal Mechanism

8.1 Committees will be constituted at the Department and University levels to look into the written complaints regarding continuous Evaluation (CE). Department Level Committee (DLC) will consist of the Department Council and a student nominee of the Department Students' Union from the concerned faculty.

8.2 University Level Committee (ULC) will consist of the Pro-Vice-Chancellor (Chairman and Convenor), the Convenor of the Curriculam Committee (vice-chairman), the Head of the Department concerned and a nominee of the Students' Union. Department Level Committee will be presided over by the HOD and the University Level Committee by the Pro-Vice Chancellor. Department Level Committee will have initial jurisdiction over complaints against CE and University Level Committee will hear appeals against Department level decisions. Complaints will have to be submitted to the Department concerned within two weeks of publication of results of CE and disposed of within two weeks of receipt of complaint. Appeals to university Level Committee should be made within one month of the decision taken by the Department level committee and disposed within two months of the receipt of the complaint.

8.3 Complaints unsolved by the University Level Grievance committee shall be placed before the Vice Chancellor.

Course Structure

Semester I

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESA	CA	Tot	
MCAC11	Digital Systems & Introduction to Microprocessors	3	0	0	60	40	100	3
MCAC12	Object Oriented Programming with C++	4	0	0	60	40	100	4
MCAC13	Discrete Mathematics	4	0	0	60	40	100	4
MCAC14	Database Management Systems	4	0	0	60	40	100	4
MCAC15	Operating Systems	3	0	0	60	40	100	3
MCAC16	Lab –I (C++ / Digital, Microprocessor)	0	4	2	60	40	100	2
MCAC17	Lab – II (OS & Linux administration / Database Management Systems)	0	3	3	60	40	100	2
Total		18	7	5				22

Semester II

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESA	CA	Tot	
MCAC21	Data structures and Algorithms using C++	4	0	0	60	40	100	4
MCAC22	Programming in Java	3	0	0	60	40	100	3
MCAC23	Computer Organization & Architecture	3	0	0	60	40	100	3
MCAE24	Elective – I	3	0	1	60	40	100	3
MCAE25	Elective – II	4	0	1	60	40	100	4
MCAC26	Lab –III (Data structures/Java)	0	5	0	60	40	100	2
MCAC27	Lab- IV (Web Programming I/VC++)	0	3	1	60	40	100	2
MCAC28	Seminar	0	0	2	0	50	50	1
Total		17	8	5				22

Semester III

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESA	CA	Tot	
MCAC31	Advanced Java Programming	3	0	0	60	40	100	3
MCAC32	Data Communication & Computer Networks	3	0	0	60	40	100	3
MCAC33	Software Engineering	3	0	0	60	40	100	3
MCAC34	Computer Graphics	4	0	0	60	40	100	4
MCAE35	Elective – III	4	0	0	60	40	100	4
MCAC36	Lab –V (Advanced java / Computer graphics)	0	5	1	60	40	100	2
MCAC37	Lab- VI (Software Development Tools I)	0	3	1	60	40	100	2
MCAC38	Seminar	0	0	2	0	50	50	1
Total		17	8	5				22

Semester IV

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESA	CA	Tot	
MCAC41	Accounting & Financial Management	3	0	0	60	40	100	3
MCAC42	Object Oriented Modeling and Design	3	0	0	60	40	100	3
MCAC43	Network Programming and Administration	3	0	0	60	40	100	3
MCAE44	Elective -IV	4	0	1	60	40	100	4
MCAE45	Elective – V	4	0	1	60	40	100	4
MCAC46	Lab –VII (Network programming / Web programming –II)	0	5	0	60	40	100	2
MCAC47	Lab- VIII (Software Development Tools II)	0	3	3	60	40	100	2
Total		17	8	5				21

Semester V

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESA	CA	Tot	
MCAC51	Advanced Microprocessors & Microcontrollers	3	0	0	60	40	100	3
MCAC52	Linux Kernel	3	0	0	60	40	100	3
MCAC53	Data Mining & Warehousing	4	0	1	60	40	100	4
MCAE54	Elective –VI	4	0	1	60	40	100	4
MCAE55	Elective – VII	4	0	1	60	40	100	4
MCAC56	Mini Project	0	7	2	60	40	100	3
Total		18	7	5				21

Semester VI

Subject Code	Subject	Duration of the Project	Marks			Credit
			ESA	CA	Total	
MCAC61	Project & Viva	18 weeks	210	140	350	12

Electives

MCAE1	Signals & Systems
MCAE2	Probability and Statistics
MCAE3	Numerical Computing
MCAE4	Graph Theory and Combinatorics
MCAE5	Fuzzy Sets & Systems
MCAE6	Operations Research
MCAE7	Design and Analysis of Algorithms
MCAE8	Simulation & Modeling
MCAE9	Digital Signal Processing (PR : MCSE1)

MCAE10	Information Theory & Coding
MCAE11	Digital Speech Processing (PR : MCSE1)
MCAE12	Pattern Recognition
MCAE13	Digital Image Processing
MCAE14	Artificial Intelligence
MCAE15	Soft computing
MCAE16	Software Architecture
MCAE17	Software Project Management
MCAE18	Cyber Forensics
MCAE19	Cryptography and Network Security
MCAE20	Mobile Computing
MCAE21	Information Storage and Management
MCAE22	Linux Device Drivers
MCAE23	Natural Language Processing
MCAE24	Cloud Computing
MCAE25	High Performance Computing
MCAE26	Big Data Analytics
MCAE27	Formal Languages & finite Automata
MCAE28	System Programming & Compiler Design
MCAE29	Linux Firewalls & IPV6 Protocols
MCAE30	Principles of Management
MCAE31	Parallel & Distributed Computing
MCAE32	Embedded Systems

Syllabus

Core Papers

\

MCAC11 DIGITAL SYSTEMS & INTRODUCTION TO MICROPROCESSORS

Unit 1

Number systems and arithmetic operations, Different Binary codes, Gates, Boolean algebra & Laws, Combinational Circuits: Sum of product, Product of sum, simplification by Boolean methods

Unit 2

K-Map Simplification- up to six variables. Tabular method. Decoders, Multiplexer, De-multiplexer, Encoder, Binary Adders, Subtractors, Magnitude comparator, ROM, PLA, PAL

Unit 3

Sequential circuits: Flip-flops, Analysis of Clocked Sequential Circuits, State Reduction and assignments, FF excitation tables, Design procedure Registers : shift registers, SISO, SIPO,.PISO, PIPO, Universal Shift Registers, Ripple Counters, Synchronous counters, Ring counter, Shift Counter, Up-down counters.

Unit 4

Logic families: General Characteristics, RTL, DTL, TTL, I^2L, ECL, NMOS, PMOS, CMOS, CMOS Transmission Gate Circuits. DAC and ADC

Unit 5

Microprocessor: Architecture of 8085, Block diagram and pin outs , Instruction set. Addressing modes, Subroutines, Interrupts.

Reference Books

1. M. Moris Mano, Digital Design – PHI 2001
2. Ronald J. Tocci, Neal S. Widmer and Grigory L. Moss, Digital Systems- Principles and applications, Pearson, 2009.
3. John . M. Yarbrough , Digital Logic Applications and Design ,Thomson -2002 .
4. Malvino A P and Leach D P, Digital Principles and applications, Tata Mc-Graw Hill,1991
5. R. Gaonkar, Microprocessor Architecture and Programming. TMH-2002.

MCAC12 OBJECT ORIENTED PROGRAMMING WITH C++

Unit 1

Introduction to OOP – overview of C++, Types and declarations, Arrays, pointers, operators, Expressions and Statements, control structures, functions, structures, union.

Unit 2

Class, Object, inline functions, constructors, destructors, scope resolution operator, friend functions, friend classes, static members, *this* pointer, references, dynamic memory allocation.

Unit 3

Function overloading, overloading constructors, pointers to functions, ambiguity in function overloading, Operator overloading, Member operator function, friend operator function, overloading some special operators like [ ], ( ), comma operator.

Unit 4

Inheritance, types of inheritance, protected members, virtual base class, polymorphism, virtual functions, pure virtual functions, Exception handling, Derived class exception, exception handling functions, terminate ( ) , unexpected ( ), uncaught( ), exception ( ).

Unit 5

Streams, formatting I /O with class functions and manipulators, overloading << and >> , File I/ O , name spaces, conversion functions, array based I /O, Standard Template Library (STL), Class templates and generic classes, function templates and generic functions, overloading a function templates, power of templates.

Reference books:

1. Herbert Schildt, C++ - the complete reference, TMH 2002
2. J.P. Cohoon and J.W. Davidson, C++ program design – An intro. to programming and Object Oriented Design.- MGH 1999.
3. Jonson, C++ programming today, PHI 2002.
4. Bjarne Stroustrup - The C++ Programming language, Addison Wesley , 3rd Ed.
5. Somashekara, Programming in C++, PHI, 2008

MCAC13 DISCRETE MATHEMATICS

Unit 1

Mathematical logic: statements and notations, connectives, normal forms, well formed formulas, implications, satisfiability and tautology, predicate calculus.

Unit 2

Set and relations: sets, subsets, operations on sets, principle of inclusion and exclusion, piano axioms and mathematic inductions, generating functions, recurrence relations. Product sets and partitions, relations, properties of relations, equivalence of relations, manipulation of relations.

Unit 3

Functions, pigeonhole principles, permutation and combinations, conbinatorics – simple counting techniques. Partially ordered sets, external elements of posets, lattices.

Unit 4

Elementary Probability Theory, Groups and semi groups:

Unit 5

Graph: definition, walks, path, trails, connected graph, regular and bipartite graph, cycles and circuits. Tree and rooted tree, spanning tree, eccentricity of vertex, radius and diameter of graph, central graph, centre(s) of a tree. Hamiltonian and Euclidian graph, planar graphs.

Reference Books

1. Kenneth H. Rosen, Discrete Mathematics and Applications, TMH 2003

2. J.P.Tremblay and R Manohar, Discrete Mathematical Structures with Applications to Computer Science, TMH 2001
3. John Truss, Discrete Mathematics for Computer Scientists, Pearson Edn 2002
4. Malik and Sen, Discrete Mathematics, Cengage Learning, 2004

MCAC14 DATABASE MANAGEMENT SYSTEMS

Unit 1

Database concepts, Relational database : Introduction to Relational model , relational algebra, views, tuple relational calculus, domain relational calculus, SQL- basic structure, set operations, sub queries, joint relation, DDL, DML, embedded SQL, QBE. Formal relational query language.

Unit 2

Database design : ER model basic concepts, constraints, Keys, ER diagram, Reduction of ER schema, UML, design of an ER database schema. Relational database design - 1st, 2nd, 3rd, 4th, BCNF, 5th Normal forms. Integrity and security, domain constraints, referential integrity, assertion, triggers, authorization in SQL, relational database design

Unit 3

Data storage and querying – storage and file structures, Indexing and hashing, basic concepts, static hashing, dynamic hashing, multiple key accesses, Query processing- Query optimization Transaction Management-Transaction concepts, transaction definition in SQL. Concurrency control, Recovery systems, deadlock handling.

Unit 4

Database system Architecture, Parallel databases, distributed databases, Data warehousing and mining-object based databases

Unit 5

Case study : PostgreSQL – data type – tables – psql – operations on tables – sub queries – views - operators & functions –indices – arrays – transactions and cursors, Administrating PostgreSQL – authentication and Encryption – Database management – User and group management –PostgreSQL programming – Pl/pgSQL.

Reference Books

1. Silbersehatz, Korth and Sudarshan, Database system concepts, 6th edition MGH 2011
2. Ramakrishnan and Gehrke, Database Management Systems, 3rd Edn, Mc Graw Hill, 2003
3. A Leon & M Leon, Database Management Systems , Leon Vikas – 2003.
4. Elmasri and Navathe, Fundementals of Database systems, 5th Edition ,Pearson 2009
5. O'Reilly, Practical PostgreSQL Shroff Publishers(SPD) 2002.

MCAC15 OPERATING SYSTEMS

Unit 1

Introduction : Introduction to Operating System -Evolution of Operating System - Serial Processing, Batch processing, Multiprogramming ,Time sharing systems, Parallel and Distributed Systems, Real Time Systems- Operating System Structure-Operating System Services – System Calls – System Programs – **Process:** Process Concept – Process Scheduling – Operations on Processes – Cooperating Process-Inter-process Communication.

Unit 2

Threads: Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria– Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

Unit 3

System Model: Deadlock Characterization – Methods for handling Deadlocks –Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks – Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging - Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing.

Unit 4

File Concept: Access Methods – Directory Structure – File System Mounting – File Sharing – Protection - File System Structure – File System Implementation – Directory Implementation – Allocation Methods - Free-space Management - Kernel I/O Subsystems - Disk Structure – Disk Scheduling.**Distributed Systems:** Network Structures: Topology, Network Types, Communication, and Design Strategies. Distributed System Structures.

Unit 5

Protection & Security Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights. Security : The Security Problem, Authentication, One-Time Passwords, Program Threats,System Threats, Threat Monitoring, Encryption, Computer-Security Classifications –Case Study -Linux overview: Kernel Architecture – Process, memory, file and I/O management

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (ASIA) Pvt. Ltd, Eighth edition, 2005.
2 A.S. Tanenbaum Modern Operating Systems, Pearson Edn, 2001
3. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, "Operating Systems", Prentice Hall, Third edition, 2003.
4 Dhamdhere, Operating Systems A Concept Based Approach, Second Edition.
5. Flaynn, McHoes, Operating Systems, Cenage Learning, 2006

MCAC21 DATA STRUCTURES AND ALGORITHMS USING C++

Unit 1

Data structures:- definition, abstract data types. Algorithms: top-down and bottom-up approaches to algorithm design. Analysis of algorithm: time and space complexity, frequency count, big oh notation , practical complexities. Arrays: representation, address calculation, Sparse matrix representation and manipulation using arrays.

Unit 2

Linked list: singly, doubly and circular linked lists, header and trailer nodes , basic operations, polynomial as linked list, manipulation of linked polynomials, sparse matrix representation using linked list. Stack: representation using arrays and linked list, applications of stack, expression evaluation. Queue: array implementation, circular queue, linked queue, priority queues, applications of queue.

Unit 3

Non linear data structures: tree – definitions, binary tree , tree traversal (both recursive and non-recursive), binary tree representation of a tree, threaded binary tree, binary search tree, application of trees, sets, decision and game trees, AVL trees, Red Black trees, B Trees.

Unit 4

Searching : sequential and binary search algorithms, Hashing. Sorting, Insertion, Selection, Bubble, Quick, Merge and Heap sort algorithms. Comparison of sort algorithms, sorting on multiple keys.

Unit 5

String representation: string matching algorithms. Graphs: representation of graphs, graph traversals, Application, Minimum Cost spanning trees, Shortest Path Problems.

Reference Books

1. E. Horowitz, S. Sahni and D. Mehta, "Fundamentals of Data Structures in C++", University Press, 2007
2. Malik, Datastructures using C++, Cengage Learning, , 2003
3. A. Drozdek, Datastructures and Algorithms in C++, Cengage Learning, 2006
4. . R. Kruse, C.L. Tondo and B. Leung, "Data Structures and Program Design in C, 2nd Edn, Pearson Education, 2003

MCAC22 PROGRAMMING IN JAVA

Unit 1

Object oriented programming, basic concepts of OOP; Introduction to Java programming, features of Java: - object oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded, distributed and dynamic; Bytecode, Java Virtual Machine (JVM), Java Applets and Applications, Java file name and directory structure; Java CLASSPATH; Packages of Java API.

Unit 2

Data Types, Variables, and Arrays, Type Conversion and Casting; Operators; Control Statements; Class, Class Fundamentals, Declaring Objects, Constructors, access specifier, static, Nested and Inner Classes, Command-Line Arguments, this Keyword ; Garbage Collection.

Unit 3

Inheritance, method overloading, Method Overriding, Dynamic Method Dispatch, Abstract Classes: Packages, Importing Packages; Interface: Defining an Interface, Implementing Interfaces; Exception Handling: try, catch, throw, throws, and finally, Java's Built-in Exceptions; Thread, Synchronization, Messaging, Runnable interface, Inter thread communication, Deadlock, Suspending, Resuming and stopping threads, Multithreading. I/O streams, File streams.

Unit 4

Applets: Applet lifecycle, working with Applets, The HTML APPLET tag. Working with Graphics. Abstract Window Toolkit (AWT): AWT Classes, Window Fundamentals, Component, Container, Panel, Window, Frame. working with Frame Windows, AWT Controls, Layout Managers, and Menus.

Unit 5

Event Handling: Events, Event Sources, Event Classes: ActionEvent, AdjustmentEvent, ComponentEvent, ContainerEvent, FocusEvent, InputEvent, ItemEvent, KeyEvent, MouseEvent, TextEvent, WindowEvent. Event Listener Interfaces, Adapter Classes.

Reference books:

1. The complete reference Java2 ,Herbert Schildt, 7th ed-2011

2. Java in a Nutshell A desktop quick Reference, 2 Edition, David Flanagan, OReilly & Associates, Inc
3. P. Radha Krishna, Object Oriented Programming through java, University Press, 2008

MCAC23 COMPUTER ORGANIZATION AND ARCHITECTURE

Unit 1

Basic structure : Basic operational concepts. Number representation and arithmetic operations. Character representations. Performance.

Instruction set Architecture: Memory locations and addresses, memory operations, instructions and instruction sequencing, addressing modes. Assembly language, stacks, subroutines, RISC vs CISC.

Unit 2

Basic I/O: Accessing I/O devices (device interface, program controlled I/O), Interrupts (enabling and disabling, handling multiple interrupts, controlling I/O device behavior, Processor control registers, exceptions).

I/O organization: Bus structure, bus operation, arbitration, Interface circuits, interconnection standards (USB, PCI, Firewire, SCSI, SATA).

Unit 3

Basic Processing Unit : Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, control signals, single bus and three bus organization, Micro programmed control, Hardwired control,

Arithmetic - multiplication of unsigned numbers (array and sequential multipliers), multiplication of signed numbers (Booth algorithm), Fast multiplication (bit pair recoding), Floating point numbers and operations.

Unit 4

Memory system : Basic concepts, Semiconductor RAMS, ROMs, DMA, Memory hierarchy, Cache memory, performance requirements, virtual memory, memory management requirements, secondary storage devices.

Unit 5

Pipelining: basic concepts, pipeline organization, issues, data dependencies, memory delays, branch delays, performance evaluation, superscalar operations.

Parallel processing: Hardware multithreading, Vector processing, Shared memory multiprocessors, message passing multi-computers.

Text book:

1. Hamacher, Vranesic, Zaky, Manjikian, Computer Organization and Embedded Systems, 4th edn, Tata Mc Graw Hill.

Reference books:

1. William Stallings, Computer Organization & Architecture – Designing for Performance, 7th Edn, Pearson
2. John P. Hayes, Computer Architecture and Organization, Third Edn, Tata McGraw Hill.

3. M. Morris Mano, Computer System Architecture, PHI 2003

MCAC31 ADVANCED JAVA PROGRAMMING

Unit 1

Java Database connectivity:- JDBC Architecture- Drivers- Database connections-Statements-Resultsets-Transactions metadata- stored procedures-error handling-BLOBs and CLOBS

Unit 2

Java Networking :- RMI -Architecture- Defining remote Objects-Creating stubs & skeletons – Seializable classes-Accessing Remote Objects-factory classes-Dynamically loaded classes-RMI activation-Registering remote objects marshalled objects CORBA –Architecture-Services-IDL-ORB-Naming service-Inter-ORB Communication-creating CORBA objects-simple server class-helper class-holder class-client and server stubs-registering with naming services, findinf remote object-adding object to naming context-initial ORB references

Unit 3

JNDI- Architecture-context-initial context class-Object in a context –Naming shell application-listing the children of acontext-binding objects –acessing directory services-X.500 dirctories-Dir context interface-Attributes and attribute interface-modifying directory entities-creating directory entities-searching.

Unit 4

Java Servlets- Servelet life cycle-servlet Basic-servlet chaining-HTTP servlets-forms and interaction-POST-HEAD and other request-server-side includes-cookies-Session tracking-databases and non-HTML Content-Request dispatching-shared attributes-resource abstraction.

Unit 5

Enterprise Java Beans:-EJB roles—EJB Client-Object –container-Transaction Management—implementing a Basic EJBObject-Implementing session Beans-Implementing Entity Beans-Deploying an enterprise Java Beans Object-Changes in EJB1.1 specification.

Reference books.

1. David Flanagan,Jim Farley, William Crawford & Kris Magnusson , Java Enterprise in a nutshell- A desktop Quick reference –O'REILLY, 2003
2. Stephen Ausbury and Scott R. Weiner, Developing Java Enterprise Applications, Wiley - 2001
3. Jaison Hunder & William Crawford, Java Servlet Programming, O'REILLY, 2002

MCAC32 DATA COMMUNICATION AND COMPUTER NETWORKS

Unit 1

Introduction, Basic concepts- Line configuration, Topology, Transmission mode, Categories of networks, Internetworks, Transmission media - Twisted pair Cable, Coaxial Cable, Optical Fiber, Satellite Communication, Cellular Telephony, Terrestrial Microwave, OSI and TCP/IP models.

Unit 2

Physical layer, Signals-Digital and analog signals, Periodic and Aperiodic signals, Composite signals, Digital data transmission- parallel transmission and serial transmission, DTE-DCE interface, EIA-232interface, X.21,Modems, Multiplexing-Frequency Division Multiplexing, Time Division Multiplexing and Wave Division Multiplexing, Switching-Circuit Switching, Packet Switching and Message Switching.

Unit 3

Data link layer, Types of Errors-Single-Bit Error and Burst Error , Error detection –Vertical Redundancy Check(VRC),Longitudinal Redundancy Check(LRC) ,Cyclic Redundancy Check(CRC) , Error correction-Single-Bit Error correction, Hamming Code Data compression-Huffman code, Data link control-Line discipline, Flow control, Error control, Ethernet, CSMA/CD, TOKEN BUS, POLLING, SONET/SDH.

Unit 4

Network layer, Networking and Internetworking devices-Repeaters, Bridges, Routers, Gateways, other Devices, Logical addressing, Internet protocols, Address mapping, Error reporting and multicasting, Delivery, Forwarding and Routing algorithms, Distance Vector Routing, Link State Routing, The Dijkstra Algorithm.

Unit 5

Transport Layer, Process-to-Process Delivery: UDP, TCP, and SCTP, Congestion Control and Quality of Service, Application Layer, Domain Name System, Remote Logging, Electronic Mail, and File Transfer, WWW and HTTP, Network Management: SNMP, Network security, Cryptography.

Reference:-

1. Data Communications and networking, Fourth Edition by Behrouz A. Forouzan, McGraw Hill 2001
2. Computer Networks, Fourth Edition by Andrew S. Tanenbaum, Prentice-Hall 2003
3. Data and computer communication , Eighth Edition by William Stallings, Prentice-Hall 2007

MCAC33 SOFTWARE ENGINEERING

Unit -1

Introduction to Software Engineering, Generic View of Process, Process Models, An agile model of process, Software Engineering Practices, System Engineering

Unit -2

Requirement Engineering, Building the Analysis Model, Design Engineering

Unit -3

Creating an architectural Design, Modeling component level design, Performing user interface design.

Unit -4

Testing Strategies, Testing Tactics, Component based development, Reengineering

Unit -5

Project Management, Different Metric for process and project, Introduction of different methods of estimation and project scheduling, risk management and change management

REFERENCES

1. Roger S Pressman, Software Engineering-A Practitioner's Approach, 6/e, McGraw Hill
2. Ian Sommerville, Software Engineering, 7/e
3. Pankaj Jalote, An Integrated Approach to Software Engineering, 3/e

MCAC34 COMPUTER GRAPHICS

Unit 1

Survey of computer Graphics – Over view of graphics systems. Color models.

Unit 2

Graphics output primitives - attributes of graphics primitives.

Unit 3

Geometric transformations – 2D viewing.

Unit 4

3D viewing – 3D object representation.

Unit 5

Visible surface detection methods – illumination models and surface rendering.

Reference

1. Hearn & Baker , Computer Graphics with OpenGL, 3rd Edition, Person, 2009.
2. Shirley, Marschner, Computer Graphics, Cengage, 2009
3. Foley, Van Dan, Hughes – Computer Graphics – Addison Wesley,2000.

MCAC41 ACCOUNTING & FINANCIAL MANAGEMENT

Unit 1

Financial accounting-scope and functions-accounting conventions and concepts-recording of business transactions-Journal-ledger, Cash book-Trial Balance.Accounting standards in India.

Unit 2

Preparation of final accounts-Trading account, Profit and loss account and Balance sheet with adjustments-Depreciation, methods of providing depreciation.

Unit 3

Analysis and interpretation of financial statements-Ratio analysis-meaning and significance-classification of ratios- common size statements-comparative analysis-Trend Analysis, Cash flow statements, fund flow statements.

Unit 4

Financial Management-Nature scope and objectives-overcapitalization and undercapitalization –cost of capital- working capital-factors affecting working capital-operating cycle.

Meaning and significance of capital budgeting decisions. Capital market-mutual funds market.

Unit 5

Cost concepts-elements of cost-cost sheet -Marginal costing-practical applications in business decisions - Cost volume profit analysis-Break even analysis-Budgetary control-nature & Scope. Nature and scope of standard costing-variance analysis.

References:-

1.Jain an d Narang, Financial Accounting ,Kalyani Publishers, 12th Edn
2. S.N.Maheswari, "Financial and Management Accounting", Sultan Chand & Sons, 5 edn,2010
3. Ashoka Banerjee, Financial Accounting, Excel Publications
4. Ambariosh Gupta, Finanacial accounting and Management, Pearson Education
5. Narayana Swami, Financial Accounting – A managerial perspective, 3rd edn, PHI
6. I.M.Pandey, Financial Management, 10th edn, Vikas Pub House.
7. Edwards, Marriott and Mellets, Introduction to Accounting, 3rd Edn, Sage.

MCAC42 OBJECT ORIENTED MODELING AND DESIGN

Unit 1

Overview of object-oriented systems, objects, attributes, encapsulation, class hierarchy, polymorphism, inheritance, messages, history of object orientation.

Unit 2

Introduction to UML, basic expression of classes, attributes, and operations, Class diagrams**:** generalization and association constructs, composition and aggregation**.** Use case diagrams, Object interaction diagrams**:** collaboration diagrams, sequence diagrams, asynchronous messages and concurrent execution**.** State diagrams**:** basic state diagrams, nested states, concurrent states and synchronisation, transient states**.** Activity diagrams

Unit 3

Architecture diagrams **:** packages, deployment diagrams for hardware artifacts and software constructs **.** Interface diagrams**:** window-layout and window-navigation diagrams**.**

Unit 4

Encapsulation structure, connascence, domains of object classes, encumbrance, class cohesion, state-spaces and behavior of classes and subclasses, class invariants, pre-conditions and post-conditions, class versus type, principle of type conformance, principle of closed behavior.

Unit 5

Abuses of inheritance, danger of polymorphism, mix-in classes, rings of operations, class cohesion and support of states and behavior, components and objects, design of a component, light weight and heavy weight components, advantages and disadvantages of using components.

Case study like Inventory management, banking applications, academic systems etc

Reference books

1 Booch. G, Rumbaugh J, and Jacobson. I, The Unified Modelling Language User Guide, Addison Wesely.
2 Booch. G, Rumbaugh J, and Jacobson. I, The Unified Modelling Language Reference Manual, Addison Wesely.
3.Bahrami.A, Object Oriented System Development, McGrawHill.
4 Page-Jones .M, Fundamentals of object-oriented design in UML, Addison Wesely

5.Larman.C, Applying UML & Patterns: An Introduction to Object Oriented Analysis & Design, Addison Wesley
6.Pooley R & Stevens P, Using UML: Software Engineering with Objects & Components, Addison Wesley.
7.Ivar Jacobson, Object Oriented Software Engineering-A use case Driven approach, Pearson Education
8.Rojer S Pressman, Software Engineering a Practitioner's Approach, 6th Edition, McGraw Hill

MCAC43 NETWORK PROGRAMMING AND ADMINISTRATION

Unit 1

TCP / IP Network Configuration: Introduction to TCP / IP network, Protocols, IP address, Hostname, Configuring a Host :setting the host name, assigning IP address, broad cast, net mask and name server address, Editing Host and network files,Interface Configuration: loop back interface, Ethernet interface, The SLIP and PPP interface, Configuring Gateway.Routing through gateway, Network commands: ping, ifconfig, netstat, route.

Unit 2

Network applications Configuration: File Transfer Protocol (FTP) and Trivial File Transfer Protocol (TFTP), Network FileSystems (NFS) . Network Information System(NIS), Hyper Text Transfer Protocol (HTTP) and Web server, ServerMessage Block (SMB) Protocol and Samba server, Dynamic Host configuration Protocol (DHCP) Firewalls-preventing unwanted connections,SE Linux.

Unit 3

Domain Name Services (DNS) and Mail services: working of DNS, Host name Resolution Name lookup with DNS,Reverse Lookup, Domain Name Servers and Zones, DNS database: SOA, NS, MX, A and PTR records, Secondary and primary DNS, Zone change notification, root servers, internet root domains, configuring DNS, Using nslookup. SimpleMail Transfer Protocol (SMTP) , Post office Protocol(POP) Multipurpose Internet Mail Extension (MIME), SMTP and POP3 command, Mail routing, Configuring A mail server.

Unit 4

Inter Process Communication programming : Create a process- fork() system call, Parent and Child Process, Process ID,User and Group ID Half Duplex Unix Pipes, Named Pipes, (First In First Out) , System V IPC : Message Queues, Semaphores, Shared memory, Sample programs for IPC that uses Pipes, FIFO.

Unit 5

Introduction to Socket Programming –Introduction to Sockets –,Socket address Structures , Byte ordering functions , address conversion functions ,Elementary TCP Sockets ,socket, connect, bind, listen, accept, read, write, close functions, , Byte ordering routines, Byte Operations, Address conversion routines, Advanced socket system calls: readv and writev, sendmsg and recvmsg, getpeername, getsockname, getsockopt andsetsockopt, shout down, select, reserved port, Simple client Programs that uses some reserved ports, Simple Client / Server Program Using Unreserved ports.

Reference Books:

1. Olaf Kirch & Terry Dawson, Linux Network Administrators Guide, O'relly, 2003
2. Hunt, Linux DNS server Administration, BPB Publication, 2003 .
3. W. Richard Stevens, "UNIX NETWORK PROGRAMMING Vol-I" Second Edition, PHI / Pearson Education, 1998. (Unit – 5)

MCAC51 ADVANCED MICROPROCESSORS & MICROCONTROLLERS

Unit 1

Internal Architecture of 8086,Functional Blocks, Instruction set and 8086 Family Assembly language programming, Assembler directives, Addressing memory and ports, Interrupts and Interrupt service procedures..

Unit 2

80286 Microprocessor and its architecture, Addressing modes-Real address and Protected virtual Address mode, Privilage, Protection , additiinal instructions in 286, concept of Math coprocessor, Memmory Management Unit concepts, Advanced features of 386 Processor and their architecture, Paging, virtual 8086 mode, enhancement in the instruction sets.

Unit 3

Architecture and special features of 486 processor. Overview of the features of Pentium and later processors, architecture – recent trends in microprocessor design.

Applications and interfacing of 8086 microprocesor with other peripherals 8251, 8255, 8253, 8257

Unit 4

Microcontrollers :Overview of Microcontrollers, Types of microcontrollers, embedded system : Hardware architecture; CPU, Memory, Clock circuitry, Watchdog Timer / Reset circuitry, Chip select, I/O devices, Debug port, Communication interfaces, Power supply units. Software architecture, services provided by an operating system, architecture of embedded operating system, Categories of embedded operating systems. Application software, communication software. Development / Testing tools.

Unit 5

Hardware platforms : Types of hardware platforms; single board computers, PC add-on cards, custom-built hardware platforms. 89C51 : architecture, instruction set and programming. AVR micro controller development board, PIC microcontrollers. 16F84 architecture, instruction set and programming.

Reference Books

1. Doughlas V. Hall, Microprocessors and Interfacing-programming and Hardware, Mc-GrawHill Publishers
2. Ray A.K., Bhurchandi K M, Advanced Microprocessors and Peripherals-Architecture, programming and interface, Tata McGraw Hill, 2000
3. Wim Wilhurt, Embedded Technology.
4. Wayne Wolf, Computers as Components – Principles of embedded Computing system Design.
5. David E. Simon, An Embedded software Primer, Pearson Education, 2002.

MCAC52 LINUX KERNEL

Unit 1

Introduction: Characteristics, multi-tasking, multi-user access, multiprocessing, architecture independence, demand load executables, paging, dynamic cache for hard disk, shared libraries, POSIX

1003.1 support, various formats for executable files, Memory protected mode, support for national keyboards and fonts, different file systems, TCP/IP, SLIP and PPP *support*; Compiling the kernel; Configuration facilities; Kernel architecture; Processes and tasks; Important data structures, task structure, process table, files and inodes, dynamic memory management, queues and semaphores, system time and timers; Main algorithms, signals, interrupts, booting the system, timer interrupt, scheduler; System call, working, getpid, nice, pause, fork, execve, exit, wait; Implementing new system calls.

Unit 2

Memory Management: Architecture independent memory model; Pages of memory; Virtual address space; Converting the linear address; Page directory; page middle directory; page table; Virtual address space; user segment; virtual memory areas; brk system call; Mapping functions; Kernel segment; Static and dynamic memory allocation in the kernel segment; Block device caching; Block buffering; update and bdflush processes; Buffer cache list structures; Paging; Page cache and management; Finding free page; reloading a page.

Unit 3

Inter-process communication**:** Synchronization; Communication via files, locking; Pipes; System V IPC, access permissions, numbers and keys, semaphores, message queues, shared memory, ipcs and ipcrm commands; IPC with sockets; Unix domain socket implementation.

Unit 4

File System**:** Basic principles; Representation in the kernel; Mounting; Superblock operations; Inode; Inode operations; File structure; File operations; File opening; Directory cache; Proc file system; Ext2 file system; Structure; Directories in ext2 file system; block allocation.

Unit 5

Device Drivers: Character and block devices; Polling and interrupts; Interrupt mode; Interrupt sharing; Bottom halves; Task queues; DMA mode; Hardware detection; Automatic interrupt detection; Driver implementation; setup function; init; open and release; read and write; IOCTL; select; lseek; mmap; readdir; fsync and fasync; check_media_change and revalidate.

Reference books:

1. M beck , Linux Kernel Internals, Second edition, Addison Wesley. 1998
2. Robert Love, Linux Kernel Development, SAMS, 2003

MCAC53 DATA MINING & WAREHOUSING

Unit 1:

Introduction – kinds of data and patterns – technologies, applications, major issues.

Data objects and attribute types – statistical descriptors of data – Data visualization, measuring data similarity and dissimilarity.

Data preprocessing – data cleaning - data integration - data reduction – data transformation and discretization.

Unit 2:

Data warehouse – Basic concepts – DW modeling (Data cube and OLAP), Design & usage, Implementation, Data generalization by attribute oriented induction

Mining frequent patterns – basic concepts - frequentitemset mining methods, Pattern Evaluation methods.

Unit 3:

Classification and prediction – basic concepts, Decision tree induction – Bayes classification – rule based classification – model evaluation and selection – Techniques to improve classification accuracy.

Unit 4:

Advanced classification methods – Bayesian Belief networks, Back propagation – Using frequent patterns, Lazy learners.

Cluster analysis - categorization – partitioning methods – hierarchical methods – density based methods – grid based methods – evaluation of clustering .

Unit 5:

Probabilistic Model based clustering.

Outlier detection – outliers and outlier analysis – outlier detection methods – statistical and proximity based approaches..

Overview of spatial, multimedia, text and web mining.

Text book:

1. J. Han, M. Kamber& J. Pei, Data Mining - Concepts and Techniques, 3rdEdn, Morgan Kauffman, 2012.

Reference Books:

1. K.P. Soman, ShyamDiwakar and V. Ajay, Insight into Data mining Theory andPractice, Prentice Hall of India, 2006.
2. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill, 2007.
3. G. K. Gupta, Introduction to Data Mining with Case Studies, 2ndedn, PHI.
4. Witten, Frank and Hall, Data Mining – Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kauffman, 2011.
5. A K Pujari, Data Mining Techniques, 2ndedn, Universities Press, 2013.

ELECTIVES

MCAE1 SIGNALS & SYSTEMS

Unit. 1

Mathematical description of signals and systems: continuous- time vs discrete- time functions, continuous-time signals functions , function and combinations of functions, continuous- time scaling and shifting transformations. Differentiations and integration of signals, continuous time even and odd functions, continuous time periodic functions , discretion and analysis of system: system characteristics, Eigen functions of continuous time functions , convolution sum, convolution integral.

Unit 2

Discrete time signals and systems: Discrete time signals, discrete time systems, analysis of discrete-time linear-time invariant systems, discrete time systems described by difference equations, implementation of discrete systems correlation of discrete time systems.

Unit 3

The Z transforms and its applications: Z transform, properties Z transform, rational Z transform, inversion of Z transform one sided Z transform analysis of linear time invariant systems in the Z domain.

Unit 4

Frequency analysis of signals and systems: frequency analysis of continuous time signals, frequency analysis of discrete time signals, properties of Fourier transformation for discrete time signals , frequency domain characteristics of linear time invariant systems, linear time invariant as frequency selective filters, inverse systems and de convolutions.

Unit 5

Discrete Fourier transform and application: Frequency domain sampling. Discrete Fourier Transform (DFT), properties of DFT, linear filtering methods based on DFT, frequency analysis of signals using DFT. Efficient computation of DFT; Fast Fourier Transform (FFT) algorithms, application of FFT algorithm, linear filtering approach to computation of DFT, quantization effects in computation of DFT.

References books:

1. Michael J. Robberts Signals and systems TMGH 2004
2. John G Proakis and Dimitres G Manolakis Digital Signal Processing PHI 2002

MCAE2 PROBABILITY & STATISTICS

Unit 1

Probability distributions : Random variables, Binomial distribution, Hyper geometric distribution, Mean and variance of probability distribution, Chebysheve's theorem, Poisson approximation to binomial, Poisson processes, Geometric distribution, Normal distribution, Normal approximation to Binomial distribution, Uniform distribution, Log-normal distribution, Gamma distribution, Beta distribution, Weibull distribution.

Unit 2

Sampling distributions and Inference Concerning Means :- Population and Samples, the sampling distribution of the mean (σ known and σ unknown), sampling distribution of variance, Point estimation, Bayesian estimation, Tests of Hypotheses, the null Hypotheses and the significance tests, Hypotheses concerning one mean, Operating characteristic curves, Inference concerning two means.

Unit 3

Inference concerning Variance and Proportions : Estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances, Estimation of proportions, Bayesian estimation, Hypotheses concerning one proportion, Hypotheses concerning several proportions, analysis of rxc tables, Goodness of fit.

Unit 4

Correlation and Regression analysis : Curve fitting, the method of least squares, inference based on the lest square estimators, curvilinear regression, correlation, fisher's transformation, inference concerning correlation coefficient.

Unit 5

Analysis of variance :- General principles, Complexity randomized design, Randomized Block diagram, Multiple comparison, Some further experimental designs, Analysis of covariance.

Reference Books

1. Probability and Statistics for Engineers (V Edn), Johnson, Miller & Freund
2. Statistics for Management, Levin & Rubin, PHI
3. Probabilities in engineering and Computer Sciences, Milton & Arnold, MGH
4. Introduction to Probability and Statistics for engineers and Scientists, Ross, John Wiley & Sons
5. Statistics – concepts and Applications, frank & Althoen, Cambridge University press

MCAE3 NUMERICAL COMPUTING

Unit 1

LINEAR SYSTEM OF EQUATIONS: Solution of Systems of equations – Solution of Simultaneous linear equations – Gauss elimination methods – Gauss Jordan methods, Jacobi and Gauss Seidal iterative methods.

Unit 2

NUMERICAL DIFFERENTIATION AND INTEGRATION: Interpolation, Differentiation and integration – difference table – Newton's forward and backward interpolation –Lagrangian interpolation –Differentiation formulae– Trapezoidal and Simpson rule Gaussian – Quadrature

Unit 3

DIFFERENTIAL EQUATIONS : Ordinary Differential equations–Taylor Series and Euler methods, Runge– Kutta methods – Predictor-corrector method – Milne and Adam – Bashforth methods – Error Analysis

Unit 4

PROBABILITY DISTRIBUTIONS : Probability axioms- Bayes Theorem- One dimensional Discrete random variables and Continuous random variables – Density and Distribution functions – Binomial and normal distribution

Unit 5

SAMPLING DISTRIBUTIONS : Small sample, t-test, F-test, χ 2 –test, ANOVA one way classification and two way classification.

REFERENCES:

1. Baghel Singh Grewal, "Numerical Methods in Engineering and Science,Khanna Publisher 2011
2. John.E..Freund, Irwin Miller, Marylees Miller "Mathematical Statistics with Applications ", Seventh Edition, Prentice Hall of India, 2011.
3. T.Veerarajan , "Probability, statistics and random process" third edition Tata Mcgrawhill publications,2009
4. Steven C. Chapra, Raymond P. Canale, " Numerical methods for Engineers", McGraw-Hill Higher Education, 01-Aug-2010
5. A.M.Natarajan & A.Tamilarasi, "Probability Random Processes and Queuing theory", New Age International Publishers, 2 nd Edition, 2005.
6. C. Woodford, "Numerical Methods with Worked Examples: Matlab Edition Springer,2012.

MCAE4 GRAPH THEORY & COMBINATORICS

Unit 1

Introduction to Graphs, definitions, subgraphs, paths and cycles, matrix representation of graphs, Euler tours, Chinese postman problem, planar graphs, Euler's formula, platonic bodies, applications of Kuratowski's theorem, Hamiltonian graphs, graph colouring and chromatic polynomials, map colouring.

Unit 2

Trees, definition and properties, rooted trees, trees and sorting, weighted trees and prefix codes, biconnected components and articulation points. Kruskal's and Prim's algorithms for minimal spanning trees.

Unit 3

Disjkstra's shortest path algorithm, Bellman – Ford algorithm, all-pairs shortest paths, Floyed – Warshall algorithms, the max-flow min-cut theorem, maximum bipartite matching.

Unit 4

Fundamental principles of counting, permutations and combinations, binomial theorem, combinations with repetition, Combinatorial numbrs, Priciple of inclusion, derangements, arrangements with forbidden positions.

Unit 5

Generating functions, partitions of integers, the exponential generating function, the summation operator. Recurrence relations, first order and second order, nonhomogeneous recurrence relations, method of generating functions.

Reference Books

1. Grimaldi R.P., "Discrete and Combinatorial Mathematics : an applied Introduction", 3e, Addison Wesley, 1994
2. Corman T. H., Leiserson C. E., Rivest R. L., "Introduction to algorithms:, Prentice Hall India, 1990
3. Mott J.L., Kandel A. and Baker T.P., "Discrete Mathematics for Computer Scientists and Mathematicians", 2e, PHI
4. Rosen K.H., "Discrete Mathematics and its Applications", 3e, McGraw Hill
5. Clark J. and Holton D. A., "A first look at Graph theory", World Scientific.

MCAE5 FUZZY SETS & SYSTEMS

Unit 1

Introduction: Fuzzy systems – Historical perspective, Utility and limitations, uncertainity and information, fuzzy sets and membership, Chance vs Fuzziness.

Classica sets and Fuzzy sets: Classical set (Operations, properties, mapping to functions). Fuzzy sets (operations, properties, Alternative fuzzy set operations).

Unit 2

Classical Relations and Fuzzy relations: Cartesian product, crisp relations (cardinality, operations, properties, composition), Fuzzy relations (cardinality, operations, properties, Fuzzy Cartesian products and composition), Tolerance and equivalence relation, Crisp equivalence and tolerance relations, Fuzzy tolerance and equivalence relations, value assignments (Cosine amplitude , Max-min method), other similarity methods, other forms of composition Operation.

Unit 3

Properties of membership functions, Fuzzification and Defuzzification: Features of the membership functions, various forms, Fuzzification, defuzzification to crisp sets, λ-cuts for fuzzy relations, Defuzzification to scalars.

Logic and Fuzzy systems: Classical logic, proof, Fuzzy logic, approximate reasoning, other forms of the implication operation. Natural language, Linguistic hedges, Fuzzy rule based systems, Graphical techniques for inference.

Unit 4

Development of membership functions: Membership value assignments (intuition, inference, rank ordering, Neural network, Genetic algorithm, inductive reasoning.)

Extension Principle: Crisp functions, mapping and relations, Functions of Fuzzy sets – extension principle, Fuzzy transform, practical considerations.

Unit 5

Fuzzy arithmetic: Interval analysis, Approximate methods of extension – DSW and restricted DSW algorithms.

Fuzzy classification: Classification by equivalence relation (crisp and Fuzzy), Cluster analysis, cluster validity, C-means clustering (Hard and Fuzzy), Fuzzy c-means algorithm.

Reference books

1. Ross, Fuzzy Logic with Engineering Applications, 3rd Edn, Wiley India.
2. Hajek P, Metamathematics of Fuzzy Logic. Kluwer, 1998
3. Rajasekharan and Viajayalakshmi pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, PHI, 2003.
4. Sivanandan and Deepa, Principles of Soft Computing, John wiley and Sons, 2007.

MCAE6 OPERATIONS RESEARCH

Unit 1

Linear programming: Formulation, Graphical Solution-2 variables, Development of Simplex Method,Artificial Variable Techniques, Big- M method, Two-Phase method, Reversed Simplex method.

Unit 2

Duality in LPP and it's formulation, Dual Simplex Method, Bounded variable method, Applications of LPP, Transportation problems, Assignment Problem, Traveling Sales persons problem.

Unit 3

Integer Programming problem (IPP), Cutting Plane algorithm, Branch and bound method of solving IPP, Dynamic programming problems and it's characteristics, Deterministic Dynamic Programming Problem.

Unit 4

Sequencing Problem, Processing n jobs through two machines and their mechanics, Processing n jobs through m machines, Processing 2 jobs through m machines, Project scheduling by PERT / CPM,Difference between PERT / CPM, Constructing the network, Critical path analysis, Float of an activity,Three time estimated for PERT, project cost by CPM.

Unit 5

Stochastic process, Classification of stochastic process, Discrete parameter Markov chains, Continuous Parameter Markov Chains, Birth and Death Processes, Queuing model and it's characteristics, Classification of Queuing Model (M/M/1): FCFS(birth and death model)z//.

Reference Books

1. Thaha H.A.- Operation Research, 9TH Edn, Pearson
2. Sharm J.K, Mathematical Models in Operation Research, TMGH, 1989.
3. Trivedi, . Probability, Statistics with Reliability, Queuing and Computer Science Applications, PHI
4. Winston, Operations Research Applications and Algorithms, 4th edn, CENGAGE, 2003

MCAE7 DESIGN AND ANALYSIS OF ALGORITHMS

Unit 1

Introduction, recursive algorithms, time and space complexities, randomized algorithms, repeated element, primality testing.

Divide and conquer- general method, finding maximum and minimum, merge sort, quick sort, selection, Strassen's matrix multiplication, convex hull algorithm.

Unit 2

Greedy method : general method, knapsack problem, tree vertex splitting, job sequencing with deadlines, optimal storage on tapes.

Unit 3.

Dynamic programming : General method, multistage graphs, all pairs shortest paths, dfs, bfs, connected components, biconnected components and dfs.

Unit 4

Back tracking : general method, 8 queens, sum of subsets, graph colouring, Hamilton cycles.

Branch and bound : General method, traveling salesperson problem.

Unit 5

Lower bound theory, comparison trees, Oracles and advisory arguments, Lower bounds through reduction, Basic concept sof Np – Hard and Np – Complete problems.

Reference books:

1. Horowitz, Sahni & Rajasekaran, Fundamentals of Computer algorithms, 2nd edn, University Press.
2. Aho, Hopcroft, Ullman, The Design and analysis of computer algorithms, Pearson
3. Baase and Gelder, Computer Algorithms Introduction to Design and analysis, 3rd edn, Pearson, 2000
4. A Levitin, Introduction to the Design and analysis of algorithms, 2nd edn, Person.

MCAE8 SIMULATION AND MODELING

Unit 1

Introduction: simulation, Merits and demerits, Areas of application, System and Environment, Components of System, Discrete and Continuous systems, types of models. Steps in simulation study, Simulation Examples, Concepts in Discrete event simulation, Event scheduling Vs Time advance algorithms.Manual simulation Using Event Scheduling, List processing. Simulation in Java, Simulation in GPSS.

Unit 2

Statistical Models: Useful statistical model, Discrete distribution, Continuous distribution,Queuing Models: Characteristics of queuing systems, queuing notations, long run measures of performance of queuing systems, Steady state behavior of Markovian models (M/G/1, M/M/1, M/M/c), Steady state behavior of finite population models, Network of Queues.

Unit 3

Random Numbers: Roles of random numbers in simulation, pseudo random number generation techniques- there properties, methods of testing PRN sequence. Random Varieties: Generation, Inverse transformation techniques, Acceptance Rejection techniques, Direct transformation technique and Convolution method.

Unit 4

Input Modeling: Data collection, identifying the Distribution, parameter estimation, Goodness of fit tests. Input models without data, Multivariate and Time series input models. Verification and Validation of Models: Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.

Unit 5

Output Analysis for a Single Model: Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state simulation. Comparison and Evaluation of Alternative

System Design: Comparison of two system design, Comparison of several system design, Meta modeling,Optimization via simulation.

Case Studies: Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network.

Text book:

1. Jerry Banks. John S. Carson & Barry L. Nelson - Discrete Event system simulation PHI India 2001.

Reference books:

1. Geoffrey Gordon, System Simulation, 2nd Edition, Prentice Hall, India, 2002.
2. N.Deo System simulations with Digital computers, PHI 1979.
3. James A Payne, Introduction to Simulation : Programming Techniques & Methods of Analysis MGH 1988 .
4. Sengupta , System Simulation and Modeling, Pearson, 2014

MCAE9 DIGITAL SIGNAL PROCESSING

Unit 1

Introduction to discrete time signals & system – Discrete time signals and systems – Properties of discrete systems – linearity – time invariance – causality – stability – convolution – difference equation representation of discrete systems – The Z transform – properties of Z transform – the inverse Z transform – System function.

Unit 2

Discrete Fourier Transform & Fast Fourier Transform. Discrete Fourier series – properties – discrete Fourier transform – properties – block convolution – decimation in – time FFT algorithms – decimation in – frequency FFT algorithms.

Unit 3

FIR Digital Filters Realizations – direct – cascade – lattice forms – hardware implementation – FIR filter design using Fourier series – use of window functions – frequency sampling design.

Unit 4

IIR Digital Filters Realizations – Direct – Cascade – Parallel forms – hardware implementation – Analog filter approximations – Butterworth and Chebychev approximations – The method of mapping of differentials – impulse invariant transformation – Bilinear transformation – Matched Z transform technique.

Unit 5

Finite word length effects in digital filters – Fixed point arithmetic – Floating point arithmetic – Block floating point arithmetic – Truncation – Rounding – Quantization error in analog to digital conversion – finite register length effects in IIR & FIR filters Limit cycles. Digital signal processing application (Only brief description required)

Reference Books:

1. Oppenheim & Ronald W Schafer, Digital Signal Processing, Pearson

2. Andreas Antoniou , Digital Signal Processing, 1st Edn, TMH.
3. Andreas Antoniou ,"Digital Filters Analysis, Design & Applications, TMH.
4. R Rabiner & B. Gold , Theory & Application of Digital Signal processing, Prentice Hall India
5. Sanjit K.Mithra , Digital Signal Processing, Tata Mc –Graw Hill
6. John G Proakis & Dimitris G Manolakis ,Digital Signal Processing , pearson
7. Kamen and Heck, Fundamentals of Signals and Systems using the Web and Matlab, 3rd edn, 2008, Pearson

MCAE10 INFORMATION THEORY AND CODING

Unit 1

Information Theory: Information and entropy, source encoding ,Noiseless coding, Shannon's first fundamental theorem,Sources with finite memory: Markov sources, Discrete channel with discrete, Shannon's second fundamental theorem on coding for memory less noisy channel, Discrete channel with continuous noise, continuous channel with continuous noise,Channel capacity theorem, Properties.

Unit 2

Error control coding: Galois fields,Vector spaces and metrics, Block codes, Binary cyclic codes, Multiple error correcting codes, Majority – logic decoding, convolutional codes, Burst error correcting codes, ARQ, Performance of codes.

Unit 3

Digital image characterization: image sampling and reconstruction concepts, Sampling systems, Reconstruction system, vector space image representation, Generalized two dimensional linear operator, image quantization, Scalar quantization, Processing quantized variables, Monochrome and color image quantization,

Unit 4

Discrete two dimensional linear processing: super position and Convolution, Finite area superposition and convolution,Circulant superposition and convolution, Unitary transforms, Generalized unitary transforms, Fourier transforms,Cosine,Sine & Hartely transforms, Hadamard, Har walsh hadamard, Karhanen- Loeve transforms, Linear processing techniques: Transform domain processing, transformed domain superposition, Fast Fourier Transformation convolution,Fourier transform filtering.

Unit 5

Image improvement: Image enhancement, Contrast manipulation noise cleaning, Edge crispening, color image enhancement, multi spectral image enhancement, Image restoration, Image restoration modes, Optical system models,Photographic process models, Discrete image restoration models,

Reference books:

1. Simon Haykin : Digital communications – John Willy & sons, 2003.
2. William K . Pratt : Digital image Processing John Willy sons, 2003..

MCAE11 DIGITAL SPEECH PROCESSING

Unit 1

Introduction to speech recognition: Introduction- the paradigm for speech recognition –history of speech recognition research, The speech signal: speech production mechanism, perception-acoustic phonetic characterization and classification- the speech production process- representing speech in time frequency domains-speech sounds and features. Approaches to automatic speech recognition by machine, speech recognition in adverse environment

Unit 2

Signal Processing and Analysis Methods for Speech Recognition: Introduction- The Bank of Filters Front End Processor- Linear Predictive Coding for Speech Recognition- Vector Quantization, Time domain parameters of speech, methods for extracting the parameters, zero crossing, auto correlation function, pitch estimation.

Unit 3

Pattern Comparisons Techniques: Introduction- Speech Detection- Distortion Measures - Spectral Distortion Measures. Incorporation of Spectral Dynamic Features into Distortion Measures- Time Alignment Normalization. Speech Recognition System Design and Implementation Issues: Introduction, Application of Source Coding Techniques to Recognition- Template Training Methods- Performance Analysis and Recognition Enhancements- Discriminative Methods in Speech Recognition.

Unit 4

Large Vocabulary Continuous Speech Recognition: Introduction, Subword Speech units, Subword Unit Models Based On HMMs, training of Subword Units, Language Models for Large Vocabulary Speech Recognition, Statistical Language Modeling, Perplexity of the Language Model, Overall recognition System Based on Subword Units, Context-Dependent Subword Units, Creation of Vocabulary-Independent Units, Semantic Postprocessor for recognition

Unit 5

Task Oriented Applications of Automatic Speech Recognition: Introduction, Speech- Recognizer Performance Scores, Characteristics of Speech- Recognition Applications, Broad Classes of Speech-Recognition Applications, Command-and-Control Applications, Projections for Speech recognition. **Speaker Verification:** Introduction, Acoustic Parameters, Similarity Measures, Text- Dependent Speaker Verification, Text- Independent Speaker Verification, Text- Prompted Speaker Verification, Identification, Verification and the Decision Threshold

Reference Books

1. Fundamentals of speech recognition- Lawrence Rabiner , Biing- Hwang Juang, Prentice hall.
2. Digital processing of speech signals – L R Rabiner and Schafer , Prentice hall. 1978.
3. Digital Signal Processing, Principles, Algotithms and Applications - John G. Proakis,Dimitris G Manolakis,

MCAE12 PATTERN RECOGNITION

Unit 1

Introduction and General Pattern recognition Concerns: Pattern Recognition, Classification and Description, Patterns and Feature extraction with examples, Training and Learning in PR Systems, Pattern recognition Approaches, Other Approaches to PR, Overview to PR Literature and Recourses.

Unit 2

Statistical Pattern Recognition: Introduction to Statistical Pattern Recognition, The Gaussian Case and Class Dependence, Discriminant functions, Additional examples, Extensions, Classifier Performance , Risk, and Errors **Supervised Learning (Training) Using Parametric and**

Nonparametric Approaches: Introduction, Parametric Estimation and Supervised Learning, Maximum Likelihood (ML) Estimation, The Bayesian Parametric Estimation Approach Supervised Learning Using Nonparametric Approaches, Parzen Windows, K-NN Nonparametric Estimation, the Nearest Neighbor Rule (NNR)

Unit 3

Linear discriminant Functions and The discrete and Binary Feature Cases: Introduction, Discrete and Binary Classification Problems, Techniques to directly Obtain Linear Classifiers **Unsupervised Learning and Clustering**: Formulation of Unsupervised learning Problems, Clustering for Unsupervised Learning And Classification

Unit 4

Introduction to neural Pattern Associators and Matrix Approaches: Neural Network- Based Pattern Associators, matrix Approaches (Linear Associative mappings) and examples, **Feed forward networks and Training by Backpropagation:** Multilayer, Feedforward Network Structure, training the Feedforward Network: The Delta rule (DR) and Generalized Delta Rule (GRD), Extension of the DR for Units in the Hidden Layers [The Generalized Delta Rule (GRD)], Extended Example: Pattern Associator for Character Classification.

Unit 5

Content Addressable Memory Approaches and Unsupervised Learning in NeurPR: Introduction, The Hopfield Approach to Neural Computing, Additional Examples of CAM Applications in PR, Unsupervised Learning in NeurPR: Self-Organizing Networks

Reference Book:

1. Fundamentals of Speech Recognition- Lawrence Rabiner, Biing-Hwang Juang,Prentice Hall
2. Pattern Recognition- Robert Schalkoff, Willey 1992.
3. Speech and Audio Signal Processing-Ben Gold and Nelson Morgan, Willey

MCAE13 DIGITAL IMAGE PROCESSING

Unit 1

Steps in Digital image Processing, Elements of Visual perception, Image Sensing and Acquisition, Image sampling and quantization, Basic pixel relationships,

Basic Intensity Transformation functions – Negatives, Log transforms, Power law transformations, Piecewise Linear Transformation functions.

Unit 2

Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Filtering in the Frequency domain : DFT of one and two variables, Properties of 2-D DFT, Basics of filtering in the Frequency domain. Image smoothing filters (Ideal Lowpass, Gaussian Lowpass), Image sharpening filters (ideal Highpass, Gaussian Highpass, Laplacian in the Frequency domain. Selective filtering – Notch filters.

Unit 3

Image restoration and reconstruction : Model, noise models, restoration in the presence of noise only – spatial filtering, Periodic noise reduction by frequency domain filtering.

Linear, Position – invariant degradation.

Color models – RGB and HIS.

Unit 4

Image compression : Fundamentals, Compression methods (Huffman, Arithmetic coding, LZW coding, run Length coding, Wavelet coding). Digital watermarking.

Morphological Image Processing: Erosion and dilation, opening and closing, Hit-or-miss transformation, Morphological algorithms (Boundary extraction, Thinning, thickening, skeletons, pruning).

Unit 5

Image segmentation : Fundamentals, Point and line and edge detection, Thresholding, Region-based thresholding.

Representation and description : Representation – Boundary following and chain codes, skeletons. Boundary descriptors – Simple descriptors, shape numbers.Regional descriptors – simple descriptors.

Text Book :

1. Gonzalez and Woods, Digital Image Processing, 3rdEdn, Pearson.

Reference Book:

1. Anil K. Jain, Fundamentals of Digital image Processing, Prentice Hall, US Ed., 1989.
2. William K. Pratt, Digital Image Processing: PIKS Scientific Inside, Wiley Interscience, 4th Ed., 2007
3. Bernd Jahne, Digital Image Processing, Springer, 6th Ed., 1997
4. Sonka, Hlavac, Boyle, Digital Image Processing and Compurter Vision, Cengage, 2008

MCAE14 ARTIFICIAL INTELLIGENCE

Unit 1

Introduction - Overview of AI applications. Introduction to representation and search.

The Propositional calculus, Predicate Calculus, Using Inference Rules to produce Predicate Calculus expressions, Application – A Logic based financial advisor.

Unit 2

Introduction to structure and Strategies for State Space search, Graph theory, Strategies for state space search, Using the State Space to Represent Reasoning with the Predicate calculus (Sate space description of a logical system, AND/OR Graph).

Heuristic Search : introduction, Hill-Climbing and Dynamic Programming, The Best-first Search Algorithm, Admissibility, Monotonicity and informedness, Using Heuristics in Games.

Unit 3

Building Control Algorithm for Statespace search – Introduction, Production Systems, The blackboard architecture for Problem solving.

Knowledge Representation – Issues, History of AI representational schemes, Conceptual Graphs, Alternatives to explicit Representation, Agent based and distributed problem solving.

Unit 4

Strong Method Problem Solving **–** Introduction, Overview of Expert System Technology, Rule Based Expert system, Model -Based, Case-Based and Hybrid Systems (Introduction to Model based reasoning, Introduction to Case Based Reasoning, Hybrid design), Introduction to Planning.

Reasoning in Uncertain Situation – introduction, logic based Adductive Inference.

Introduction to PROLOG , Syntax for predicate Calculus programming, ADTs, A production system example.

Unit 5

Machine Learning: Symbol Based – Introduction, Frame –work. The ID3 Decision tree Induction algorithm. Inductive bias and Learnability, Knowledge and Learning, Unsupervised learning, Reinforcement Learning,

Machine Learning : Connectionist – Introduction, foundations, Perceptron learning.

Machine learning : Social and emergent: Models, The Genetic Algorithm, Artificial Life and Social based Learning.

Text book :

1. George F Luger, Artificial Intelligence – Structures and Strategies for Complex probel solving, 5thEdn, pearson.

Reference Books:

1. E. Rich, K. Knight, S B Nair, Artificial intelligence, 3rdEdn, McGraw Hill.
2. S. Russel and p. Norvig, Artificial intelligence – A Modern Approach, 3rdEdn, pearson

D W Patterson, introduction to Artificial Intelligence and Expert Systems, PHI, 1990

MCAE15 SOFT COMPUTING

Unit 1

Introduction to soft Computing Paradigm, Artificial Neural Networks – fundamental concepts, Evolution, Basic models, impoertant terminologies, MP – Neuron, Linear separability, Hebb network. Supervised learning networks – Perceptron network: Theory, Learning rule, Architecture, Training process, Training algorithm for single output class.

Back-propagation network : theory, Architecture, Training process, Learning factors, testing.

Unit 2

Associative Memory networks: introduction, Training algorithms for pattern association: Hebb rule, Outer Products rule. Autoassociative Memory Networks: Theory, architecture, training process and algorithm, testing.

Unsupervised Learning networks :Kohenen self-Organizing feature maps: Theory, Architecture, Training algorithm.

Adaptive Resonance Network – Theory: fundamental architecture, operating principle and algorithm. ART-1: Architecture, training process and algorithm.

Unit 3

Introduction: Fuzzy systems – Historical perspective, Utility and limitations, uncertainity and information, fuzzy sets and membership, Chance vs Fuzziness.

Classical sets and Fuzzy sets: Classical set (Operations, properties, mapping to functions). Fuzzy sets (operations, properties, Alternative fuzzy set operations).

Classical Relations and Fuzzy relations: Cartesian product, crisp relations (cardinality, operations, properties, composition), Fuzzy relations (cardinality, operations, properties, Fuzzy Cartesian products and composition), Tolerance and equivalence relation, Crisp equivalence and tolerance relations, Fuzzy tolerance and equivalence relations

Unit 4

Properties of membership functions, Fuzzification and Defuzzification: Features of the membership functions, various forms, Fuzzification, defuzzification to crisp sets, λ-cuts for fuzzy relations, Defuzzification to scalars.

Logic and Fuzzy systems: Classical logic, proof, Fuzzy logic, approximate reasoning, other forms of the implication operation. Natural language, Linguistic hedges, Fuzzy rule based systems, Graphical techniques for inference.

Development of membership functions: Membership value assignments (intuition, inference, rank ordering)

Unit 5

Genetic Algorithms: Fundamentals of genetic algorithm: history, basic concepts, creation of offsprings, working principle, Encoding, fitness function, reproduction.

Genetic modeling: inheritance operators, cross over, inversion and deletion, Mutation operators, Bit-wise operators used in GA, Generational cycle, convergence, application (any one).

Text Books :

1. Sivanandan, Deepa, Principles of Soft Computing, 2nd Edn, Wiley India.
2. Rajasekharan and Viajayalakshmipai, Neural Networks, Fuzzy Logic and Genetic Algorithm, PHI, 2003. (For Unit 5)

Reference Books:

1. B. Yegnanarayana, Artificial Neural Networks, PHI
2. Satish Kumar, Neural Networks a class room approach, 2nd Edn, McGraw Hill.
3. Ross, Fuzzy Logic with Engineering Applications, 3rd Edn, Wiley India

MCAE16 SOFTWARE ARCHITECTURE

Unit 1

Software Architecture - Foundations - Software architecture in the context of the overall software life cycle – Key architectural Principles, Common Application Architecture, Design Principles, Architectural Styles - Global Analysis - Factors affecting the architecture development of a software.

Unit 2

Conceptual Architecture View, Module Architecture View, Styles of the Module Viewtype - Execution Architecture View, Code Architecture - View. Component-and-Connector Viewtype - Styles of Component-and-Connector Viewtype - Allocation Viewtype and Styles – Documenting Software Interfaces, Documenting Behavior - Building the Documentation Package.

Unit 3

Archetypes and Archetype Patterns.Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern. , Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern. Design Patterns, Creational Patterns, Patterns for Organization of Work, Access Control Patterns.

Unit 4

Service Oriented Architecture, Service Variation Patterns, Service Extension Patterns, Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution.

Unit 5

Patterns for Interactive Systems. Adaptable Systems, Frameworks and Patterns, Patterns for Concurrent and Networked Objects, Patterns for Resource Management, Pattern Languages.

Reference Books

1. Hofmeister, Nord, Soni, Applied Software Architecture, Addison-Wesley
2. Paul Clements et al., Documenting-software-architectures-views-and-beyond, 2nd edn, Pearson
3. Arlow&Neustadt, Enterprise Patterns And MDA-Building Better Software With Archetype Pattern An UML, Pearson, 2004
4. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal, Pattern-Oriented Software Architecture, Vol 1 - A System Of Patterns, Wiley.
5. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns, Pearson

MCAE17 SOFTWARE PROJECT MANAGEMENT

Unit 1

Software Project and Characteristics, Project Constraints, Project Life Cycle and Process Life Cycle. Factors in Designing a Project Structure, Types of Project Organization Structures, Different Management Styles. Project Enabling Processes and Project Facilitating Processes. Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, Software Project Management activities, SPM Framework, Common problems with software projects.

Unit 2

Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Elements of a Project Plan. Steps to a Well Defined Project Plan. Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Methods of representing WBS, Application of the WBS. Structure of a Software Project Management Plan.

Unit 3

Software project estimation, Software Effort estimation techniques. Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Activity Planning, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts. Project Schedule Management. Ways to Organize Personnel.

Unit 4

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index(SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

Unit 5

Concept of Software Quality, Activities of Software: Quality Planning, Quality Assurance, Quality Control, Tools and techniques for Quality Control. Software Quality Attributes, Software Quality Indicators, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring,

Reference Books:

1. Manish Kumar Jha, Software Project Management, Dhanpat Rai & Co
2. Bob Hughes, Mike Cotterell, Software Project Management, Rajib Mall : Tata McGraw Hill

MCAE18 CYBER FORENSICS

Unit 1

Computer Forensics Fundamentals: What is Computer Forensics?, Use of Computer Forensics in LawEnforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement - Computer Forensic Technology - Types of Business Computer Forensic

Technology Computer Forensics Evidence and Capture: Data Recovery Defined -Data Back-up and Recovery-The Role of Back-up in Data Recovery - The Data- Recovery Solution.

Unit 2

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options obstacles-- Types ofEvidence - The Rules of Evidence-Volatile Evidence - General Procedure - Collection and Archiving - Methods of Collection -Artifacts - Collection Steps - Controlling Contamination: The Chain of Custody. Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene – Computer Evidence Processing Steps - Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication – Practical Consideration -Practical Implementation

Unit 3

Computer Forensics analysis and validation: Determining what data to collect and analyze,validating forensic *data.* addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

Processing Crime and Incident Scenes: Identifying digital evidence. collecting evidence in private-sectorincident scens, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

Unit 4

Current Computer Forensic tools: evaluating computer forensic tool needs, computer lOrensics software tools, computer forensics hardware tools, validating and testing forensics software

E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in email, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones arid mobile devices.

Unit 5

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures.Examining NTH disks.Understanding whole disk encryption, windows registry.NI Microsoft startup tasks. MS-DOS startup tasks, virtual machines.

Reference Books:

1. Jhon R. Vacca, Computer Forensics, Computer Crime Investigation, Firewall Media, New Delhi.
2. Nelson. Phillips Enfinger.Steuart, Computer Forensics and Investigations, CENGAGE Learning
3. Britz, Computer Forensics and Cyber Crime – An Introduction, 2nd Edn, Pearson.

MCAE19 CRYPTOGRAPHY AND NETWORK SECURITY

Unit 1

Foundations of Cryptography and security: Ciphers and secret messages, security attacks and services.

Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques), steganography.

Mathematics for cryptography: Euclid's algorithm , modular arithmetic, Linear congruence , Groups, rings and fields, finite fields, polynomial arithmetic.

Unit 2

Block cipher principles – The data encryption standard (DES) – strength of DES – Differential and linear cryptanalysis – Block cipher design principles.

Advanced encryption standard – AES structure – AES transformation function – key expansion – implementation.

Block cipher operations – Multiple encryption – ECB – CBC – CFM – OFM – Counter mode.

Pseudo Random Number generators - design of stream cipher, RC4.

Unit 3

Public Key cryptography: Prime numbers and testing for primality, factoring large numbers, discrete logarithms.

Principles of public-key crypto systems - RSA algorithm.

Diffi-Helman Key exchange, Elgammal Cryptographic systems - elliptic curve arithmetic, elliptic curve cryptography.

Hash functions – examples – application – requirements and security – Hash function based on Cipher block chaining – Secure Hash algorithm.

Unit 4

Message authentication requirements - Message authentication functions – requirements of message authentication codes - MAC security – HMAC – DAA – CCM – GCM.

Digital signatures, ElGamal and Schnorr Digital signature schemes, Digital signature standard.

Unit 5

Key management and distribution – Symmetric key distribution using symmetric and asymmetric encryption. Distribution of public keys, Public Key Infrastructure,

User Authentication: Kerberos.

Electronic mail security: Pretty Good Privacy, S/MIME.

IP and Web security protocols : secure socket layer and transport layer security, HTTPS – IP security overview and policy.

Firewall and Intrusion Detection: virus and related threats, virus counter measures, intrusion detection and password management, firewall design principles.

Reference books

1. William Stallings, Cryptography and Network Security, Pearson 2004
2. Foorouzan and Mukhopadhyay, Cryptographiy and Network security, 2nd edn
3. Buce Schneier., Applied cryptography – protocols and algorithms, Springer Verlag 2003
4. William stallings, Network Security Essentials, , 4th edn, Pearson
5. Pfleeger and Pfleeger, Security in Computing, 4th Edn, Pearson

MCAE20 MOBILE COMPUTING

Unit 1

Introduction to Mobile computing: Functions, types of networks, architecture for mobile computing, design considerations for mobile computing.

Unit 2

Evolution of telephony, multiple access procedures, satellite communication systems, mobile computing through telephone, IVR, Voice XML, Bluetooth, RFID, WiMAX, Mobile IP, IPv6.

Unit 3

GSM – architecture, entities, call routing, PLMN interfaces, GSM addresses and identifiers, network aspects in GSM, mobility management, GSM frequency allocation, authentication and security. SMS –architecture and types. GPRS – GPRS and packet data network, GPRS network architecture, GPRS network operations, Data services in GPRS.

Unit 4

WAP – WAP protocol stack, WAP application environment, WML &WMLScript, WAP Push architecture, Protocols used in WAP, WAP Gateway. CDMA & 3G – Spread-Spectrum Technology, CDMA v/s GSM, IS-95 standards, 802.11 standards, Third generation networks and applications on 3G, WLAN architecture.

Unit 5

Voice over IP – H.323 Framework, SIP, Real time protocols, Convergence technologies, Call routing, VoIP applications, Mobile VoIP, Voice over WLAN.

Text Book:

1. AsokeTalukder, Hasan Ahmed, and RoopaYavagal. Mobile Computing, Technology, Applications and Service Creation, 2d Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi. 2010.

Reference Books:

1. Raj Kamal. Mobile Computing, Oxford University Press. 2007.
2. ItiSahaMisra. Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill Education Pvt. Ltd., New Delhi. 2009.
3. Schiller, Mobile communication, 2nd edn, Pearson
4. Perahia and Stacey, Next Generation Wireless LANs, Cambridge, 2009
5. Shende, Mobile computing for beginners, ShroffPubl& Distributers, 2012
6. ReezaB'Far, Mobile computing principles, Cambridge, 2005

MCAE21 INFORMATION STORAGE AND MANAGEMENT

Unit 1

Storage System: Evolution of storage technology and architecture, Data center infrastructure, Information life cycle. Components of a storage system environment, Disk drive components and performance parameters, Logical components of the host. RAID implementation and impact on performance.Intelligent storage system, components, intelligent storage array.

Unit 2

Storage Technologies: Direct attached storage: types, benefits, interfaces. Parallel SCSI – architecture, communication model, addressing, command model. Storage area network: components, connectivity, ports, fibre channel architecture, zoning, topologies. Network attached storage: NAS devices and benefits, NAS file I/O, NAS components, NAS implementations, NAS File sharing protocols, NAS I/O operations, Factors affecting NAS performance and availability.

Unit 3

Storage Networks and Virtualization: IP SAN: iSCSI, FCIP. Content addressed storage: Fixed content and archives, types of archives, Features of CAS, CAS architecture, Object storage and retrieval in CAS. Storage virtualization: Forms of virtualization, Taxonomy, Configurations, Challenges, Types of virtualization.

Unit 4

Backup, Archive, and Replication - Backup: Purpose, Backup considerations, Granularity, Recovery considerations, Backup methods and process, Backup and restore operations, Backup topologies, Backup technologies. Local Replication: Use of local replicas, Data consistency, Local replication technologies, Restore and restart considerations, Creating multiple replicas. Remote Replication: Methods, Technologies.

Unit 5

Storage Security and Management: Storage security framework, Risk triad, storage security domains, Security implementations in storage networking. Managing the storage infrastructure: Monitoring, Management activities, Management challenges and solutions.

Reference Books:

1. EMC Education Services, Information Storage and Management**,** Wiley Publishing, 2009.
2. Robert Spalding, Storage Networks: The Complete Reference, Osborne/Tata McGraw Hill 2003.
3. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne,2nd Edition, 2001.
4. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education, 2002.

MCAE22 LINUX DEVICE DRIVERS

Unit 1

An introduction to Device Drivers: The role of the device driver, Splitting the kernel, Classes of devices and modules, Security issues.

Building and running modules: Kernel modules Vs applications, User space and kernel space, Concurrency in kernel, Current process, Compiling and loading, The kernel symbol table, Error handling in init_module, Usage count, I/O ports and I/O memory, Advantages and disadvantages of user space.

Unit 2

Char Drivers: Major and minor numbers, Dynamic allocation of major numbers, Removing a driver from the system, dev_t and kdev_t, File operations, File structure, open and release, Introduction to race conditions, Read and write, Device file system.

Enhanced Character driver operations: ioctl, Blocking I/O, Poll and select, Asynchronous notification.

Flow of Time: Time intervals in kernel, Knowing the current time, Delaying execution, Task queues, Kernel timers.

Unit 3

Hardware Management: I/O Ports and I/O Memory, Using I/O ports, Using digital I/O ports, An overview of parallel ports, Using I/O memory.

Interrupt Handling: Overall control of interrupts, Installing an interrupt handler, Implementing a handler, Tasklets and bottom half processing, Tasklets, The BH mechanism, Interrupt sharing, Interrupt driven I/O, Race conditions, Circular buffers, Spin locks, Lock variables.

Kmod and Advanced Modularization: Loading modules on demand, Requesting modules in the kernel, The use space side, Module loading and security, Intermodule communication.

Unit 4

Mmap and DMA: Memory management in Linux, Address types, High and low memory, The memory map and struct page, page Tables, Virtual memory areas, The mmap device operation, The kiobuf interface, Direct memory accessing and Bus mastering.

Network Drivers: Connecting to the kernel, Thenet_device structure, Opening and closing, Packet Transmission, Controlling transmission concurrency, Packet reception, The interrupt handler, The socket buffers, MAC address resolution, Multicasting.

Unit 5

Overview of Peripheral Buses: The PCI Interface, PCI Addressing, PCI Interrupts, PC/104, PC/104+, MCA, EISA, SBus, NuBus, External Buses, USB.

Physical Layout of The Kernel Source: Booting the kernel, Theinit process, The kernel directory, The fs directory, The mm directory, The net directory, ipc and lib, Drivers.

Reference Books:

1. Alessandro Rubini and Jonathan Corbet. "Linux Device Drivers. ", 3rd edn. O'Reilly.
2. S. Venkateswaran, Essential Linux Device Drivers, Pearson Edn, 2008.

MCAE23 NATURAL LANGUAGE PROCESSING

Unit 1

Morphology and Finite State transducers, N – grams.

Unit 2

Word classes and part of speech tagging, Context free grammars for English, Parsing with context free grammars.

Unit 3

Features and Unifications, Lexicalized and Probabilistic parsing.

Unit 4

Semantics: Representing meaning, Semantic analysis, Lexical semantics, Word Scene Disambiguation and Information retrieval.

Unit 5

Pragmatics: Discourse, Dialog and Conversational Agents, Natural Language Generation, Machine Translation.

Text book :

1. Jurafsky and Martin, Speech and Language Processing, Pearson, 2013

Reference Books:

1. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press
4. Kao, Natural Language Processing and Text Mining, Springer

MCAE24 CLOUD COMPUTING

Unit 1

CLOUD COMPUTING BASICS Cloud computing components- Infrastructure-services- storage applications database services – Deployment models of Cloud- Services offered by Cloud- Benefits and Limitations of Cloud Computing – Issues in Cloud security- Cloud security services and design principles.

Unit 2

VIRTUALIZATION FUNDAMENTALS :Virtualization – Enabling technology for cloud computing- Types of Virtualization- Server Virtualization- Desktop Virtualization – Memory Virtualization – Application and Storage Virtualization- Tools and Products available for Virtualization.

Unit 3

SAAS AND PAAS: Getting started with SaaS- Understanding the multitenant nature of SaaS solutions- Understanding OpenSaaS Solutions- Understanding Service Oriented Architecture- PaaS- Benefits and Limitations of PaaS. Security as a Service.

Unit 4

IAAS AND CLOUD DATA STORAGE UnderstandingIaaS- Improving performance through Load balancing- Server Types within IaaS solutions- Utilizing cloud based NAS devices – Understanding Cloud based data storage- Cloud based backup devices- Cloud based database solutions- Cloud based block storage.

Fundamentals of of big data and hadoob

Unit 5

CLOUD APPLICATION DEVELOPMENT - Client Server Distributed Architecture for cloud – Traditional apps vs. Cloud apps - Client side programming model: Web clients. Mobile clients- Server Side.Programming Technologies : AJAX, JSON, Web Services (RPC, REST)- MVC
Design Patterns for Cloud Application Development.

Reference Books:

1. Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill Edition, Fourth Reprint, 2010
2. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, "Virtualization, Business Models, Mobile, Security and more, Jones & Bartlett Learning Company, 2013
3. Ronald L.Krutz, Russell vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing Inc., 2010.
4. Kumar Saurabh, Cloud Computing, Wiley India
5. Gautam, Enterprise Cloud Computing Technology Architecture Applications, Shroff

MCAE25 HIGH PERFORMANCE COMPUTING

Unit 1: Parallel Processing Concept

Levels of parallelism (instruction, transaction, task, thread, memory, function)- Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc)- Architectures: N-wide superscalar architectures, multi-core, multi-threaded

Unit 2: Parallel Programming with CUDA

Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture- Memory hierarchy and transaction specific memory design- Thread Organization

Unit 3: Fundamental Design Issues in Parallel Computing

Synchronization- Scheduling- Job Allocation-Job Partitioning- Dependency Analysis- Mapping Parallel Algorithms onto Parallel Architectures- Performance Analysis of Parallel Algorithms

Unit 4: Fundamental Limitations Facing Parallel Computing and power aware techniques

Bandwidth Limitations- Latency Limitations- Latency Hiding/Tolerating Techniques and their limitations- Power-aware Processing Techniques-Power-aware Memory Design- Power-aware Interconnect Design-Software Power Management.

Unit 5: Advanced Topics

Petascale Computing-Optics in Parallel Computing- Quantum Computers- Recent developments in Nanotechnology and its impact on HPC

References

1. George S. Almasi and AlanGottlieb, Highly Parallel Computing, Benjamin Cumming Publishers.

2. Kai Hwang ,Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw Hill 1993

3. David Culler, Jaswinder Pal Singh, Anoop Gupta, Parallel Computer Architecture: A hardware/Software Approach, Morgan Kaufmann, 1999.

4. K. Hwang& Z. Xu, Scalable Parallel Computing – Technology, Architecture, Programming., McGraw Hill 1998.

5. William James Dally and BrianTowles, Principles and Practices on Interconnection Networks, Morgan Kauffman 2004.

6. Hubert Nguyen , GPU Gems 3, Addison Wesley, 2008, (Chapter 29 to Chapter 41)

7. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, Introduction to Parallel Computing, , 2nd edition, Pearson, 2003.

8. David A. Bader (Ed.), Petascale Computing: Algorithms and Applications, Chapman & Hall/CRC, 2008.

MCAE26 BIG DATA ANALYTICS

Unit 1

Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

Unit 2

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP)

Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Unit 3

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS-Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.

Unit 4

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration - Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud.

Unit 5

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

Reference Books

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Tom White, Hadoop: The Definitive Guide, 3rd Edn, O'reily Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Pub, 2012
4. Anand Rajaraman & Jeffrey D Ullman, Mining of Massive Datasets, Cambridge University Pres, 2012.
5. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
6. Glen J. Myyat, Making Sense of Data, John Wiley & Sons, 2007
7. Pete Warden, Big Data Glossary, O'Reily, 2011 .
8. Han, Kamber, Data Mining Concepts and Techniques, 3rd Edn, Morgan Kauffman, 2012.
9. Da Ruan, Guoquing Chen, Etienne E.Kere, Geert Wets, Intelligent Data Mining, Springer,2007

MCAE27 FORMAL LANGUAGES & FINITE AUTOMATA

Unit 1

Introduction to the Theory of computation and Finite Automata: Mathematical preliminaries and notation, Proof techniques, Three basic concepts: languages, grammar & automata. Some applications.

Unit 2

Finite automata,Regular expressions and languages Deterministic Finite Acceptors, Nondeterministic Finite Acceptors, Equivalence of deterministic and nondeterministic finite acceptors, Reduction of the number of states in finite automata, Regular expressions, connection between regular expressions and regular languages , regular grammars, closure properties of regular languages, identifying non regular language.

Unit 3

Context-free grammars & languages Context-free grammars, parsing and ambiguity, context-free grammars and programming languages, methods of transforming grammars, two important normal forms.

Unit 4

Pushdown automata for context-free languages Non deterministic pushdown automata and context-free languages, deterministic pushdown automata and deterministic context-free languages, pumping lemmas for cotext free languages and linear languages, closure properties for context-free language.

Unit 5

Turing machine Standard turing machine, combining turing machines for complicated tasks, Turing's thesis, other models of turing machine, a universal turing machine, nondeterministic turing machine and other bounded automata.

Reference Books

1. An introduction to Formal Languages and Automata, Peter Linz, 4th edn, Narasa publishing House, 2007
2. Introduction to Languages and the Theory of Automata- John C Martin MGH 1997
3. Introduction to Automata Languages and Computation,- J P Hopcroft. J D Ullman, Narosa Publication,

MCAE28 SYSTEMS PROGRAMMING & COMPILER DESIGN

Unit l

Assemblers: Elements of Assembly Language Programming, Overview of Assembly Process, Design of Two pass Assembler, Macros and Macro Processors, Macro definition, call and expansion, Nested Macro calls, Advanced Macro facilities, Design of Macro preprocessor.

Unit 2

Linkers: Linking and Relocation concepts, Design of linkers, Self relocating programs, Linking for over-lays, Loaders. Introduction to compilers: Different Phases. Lexical Analysis: role of the lexical analyzer, input buffering, specification of tokens, Recognition of tokens, lexical Analyzer generators, Lex.

Unit 3

Syntax Analysis: role of the parser Context free grammar, writing a grammar, Top down parsing, Recursive descent parsing, Predictive parsing. Bottom Up Parsing, Shift Reduce parsing, Operator precedence parsing, LR parsers (SLR, Canonical and LALR). Parser generators, Yacc.

Unit 4

Syntax-directed translation – Syntax-directed definitions: S-attributed definition, L-attributed definition. Top-down and bottom-up translation, Type checking, Type systems, Specification of a type checker. Run time Environment: source language issues, storage organization Storage organization schemes, Activation records. Storage allocation strategies, Access to non-local names. Parameter passing mechanisms. Symbol tables.

Unit 5

Intermediate code generation, intermediate languages, declaration and assignment statements. Code generation: Issues, target machine, run time storage management, Runtime storage allocation, basic blocks and flow graphs. Code optimization: Principal sources of optimization.

Text books:

1. D.M. Dhamdhree, "Systems Programming and Operating Systems", TMH, 2003.
2. A.V. Aho, R. Semi, J.D. Ullman, "Compilers - Principles, techniques and tools", Pearson Education, 2003

MCAE29 LINUX FIREWALLS & IPV 6 PROTOCOLS

Unit I

Preliminary Concepts underlying Packet-Filtering firewalls- The TCP/IP reference networking model, Service ports, packets. Packet filtering concepts- A packet filtering firewall, Choosing a default packet- filtering policy, rejecting versus denying a packet, filtering incoming packets, filtering outgoing packets, private versus public network services; Building and installing firewalls- The Linux firewall administration program, initializing the firewall, filtering ICMP control and status messages, protecting services on assigned unprivileged ports, enabling basic, required internet services, enabling common TCP services, enabling common UDP services, logging denied incoming packets, denying access to problem sites up front, enabling LAN access, installing the firewall

Unit 2

LAN security issues, multiple, firewalls, and perimeter networks :- LAN, Configuration options for a trusted home LAN, configuration options for a larger or less trusted LAN, A formal screened-subnet firewall. Debugging the firewall rules, general firewall development tips, listing the firewall rules ,Checking the input, output, and forwarding rules, testing an individual packet against the firewall rules. System level security and monitoring- Checking the network interfaces with ifconfig, checking the network connection with ping, checking the network process with netstart, checking all process with ps-ax, interpreting the system logs, Security tools, Firewall tools;

Unit 3

IPV 6 Protocols:-Ipv6 versus Ipv4, history of Ipv6, overview of Ipv6, The Structure of the Ipv6 Protocol, Ipv6 header format, Extension Headers: extension header order, options, hop-by-hop option header , routing header, fragment header, destination option header, no text header; Packet size issues, Ipv6 Addressing, address format, address notation, address types, international registry services, and prefix allocation. ICMPv6, ICMPv6 message format, the ICMPv6 Error messages, Informational Messages, the ICMPv6 header in a trace file.

Unit 4

Security in Ipv6:- security concepts, requirements, and current solutions; IPSEC framework, security elements available in IPV6 for authentication and encryption, Quality of Service in Ipv6, basic requirements and types of QoS ; different QoS architectures, resource reservation; Networking

Aspects, Layer 2 support for Ipv6 (Ethernet, Token Ring, ATM, Frame Relay etc), multicast support and multicast routing, Mobile Ipv6; Routing Protocols, advanced routing features with Ipv6 , RIPng, OSPFv3 for Ipv6, BGP extensions for Ipv6, IS-IS, and EIGRPv6

Unit 5

Upper Layer Protocols:- changes for TCP and UDP & DHCPv6, DNS extensions for Ipv6, SLPv2 in Ipv6 networks, FTP, Telnet and Web servers.

Reference books:

1. Robert L. Ziegler, Linux Firewalls, New Riders 2001
2.Silvia Hagen ,Ipv6 Essentials , O'Reilly & Associates 2002.
3. Marcus Goncalves, Kitty Niles, Hands-On Ipv6, McGraw-Hill 2002

MCAE30 PRINCIPLES OF MANAGEMENT

Unit 1

Historical Development, Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization.

Unit 2

Planning, Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

Unit 3

Organizing, Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

Unit 4

Directing, Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

Unit 5

Controlling, System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization, International Management and Global theory of Management.

References

1.Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill, 1998
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

3.Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 1999.
4. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996
5. JAF Stomer, Freeman R. E and Daniel R Gilbert, "Management", Pearson Education, Sixth Edition, 2004.
6. Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.
7. R. L. Daft, Principles of /management, Cengage Learning, 2009

MCAE31 PARALLEL AND DISTRIBUTED COMPUTING

Unit 1

Pipelining : Linear Pipeline processor: nonlinear pipeline processor, Instruction pipeline design, Mechanism for instruction pipelining, dynamic instruction scheduling, Branch handling techniques, Arithmetic pipeline design. Instruction level Parallelism : Super scalar processors, VLIW architecture.

Unit 2

Parallel Computer Models and Program Parallelism : Classification of machines, SISD, SIMD and MIMD, condition of parallelism, data and resource dependencies, hardware and software parallelism, program partitioning and scheduling, grain size latency, program flow mechanism, control flow vs data flow, data flow architectures, demand driven mechanisms, comparison of flow mechanisms.

Unit 3

Vector Processors and synchronous Parallel Processing **:** Vector instruction types, vector – access memory schemes, vector and symbolic processors. SIMD architecture and programming principles. Basic dataflow computers, Fault Tolerent architectures, Transputers, Optical Computing.

Unit 4

Distributed Operating systems – basic concepts.

Unit 5

Introduction to cluster and grid computing. Fundamentals of Cloud computing

Reference books:

1. Hennessey & Paterson, "Computer Architecture: A quantitative approach", MK Publisher, 2002
2. Hwang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill
3. Ghose, Moona and Gupta, "Foundations of parallel processing", Narosa Publication.

MCAE32 EMBEDDED SYSTEMS

Unit 1

Introduction : Application areas, Categories of Embedded systems; Standalone, Real-time systems, Networked information Appliances, Mobile devices. Overview of embedded system architecture, specialties of embedded systems; reliability, performances, power consumption, cost, size, Limited user interface, Software upgradation capability. Recent trends in embedded systems; Processor power, memory, Operating systems, application software, communication interfaces and networking capability, programming languages, Developing tools, Programmable hardware.

Unit 2

Architecture of embedded system : Hardware architecture; CPU, Memory, Clock circuitry, Watchdog Timer / Reset circuitry, Chip select, I/O devices, Debug port, Communication interfaces, Power supply units. Software architecture, services provided by an operating system, architecture of embedded

operating system, Categories of embedded operating systems. Application software, communication software. Development / Testing tools.

Unit 3

Hardware platforms : Types of hardware platforms; single board computers, PC add-on cards, custom-built hardware platforms. 89C51 : architecture, instruction set and programming. AVR micro controller development board, PIC microcontrollers. 16F84 architecture, instruction set and programming.

Unit 4

Communication interfaces : Need for communication interfaces, RS 232 / UART. RS422 / RS485. USB, Infrared, IEEE 1394, fire wire, IEEE 802.11, Blue tooth.

Unit 5

Embedded / real-time operating system concepts: Architecture of the kernel, Task and task scheduler, Interrupt Services routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, signals, Timers, Memory management, Priority inversion problem, Case studies : RT Linux.

Reference books:

1. Wim Wilhurt, Embedded Technology.
2. Wayne Wolf, Computers as Components – Principles of embedded Computing system Design.
3. David E. Simon, An Embedded software Primer, Pearson Education, 2002.