KANNUR UNIVERSITY

(Abstract)

Master of Computer Applications (MCA) 3 Year Programme under Choice Based Credit Semester System in the University Department– Revised Regulation, Scheme, Syllabus & Model Question Papers Implemented with effect from 2015 admission- Orders issued.

ACADEMIC 'C'SECTION

U.O. No.Acad/C4/ 650/2016 Civil Station P.O, Dated, 25-01-2016

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. Meeting of the Syndicate Sub-Committee held on 16.01.2015.
4. Meeting of the Curriculum Committee held on 10.04.2015.
5. U.O No.Acad/C4/14536/2014 dated 29.05.2015.
6. Meeting of the Department Council held on 31.07.2015.
7. Letter from the 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 Schools/Departments of the University with effect from 2010 admission as per the paper read (1) above and certain modifications were effected to the same vide paper read (2).

2. The meeting of the Syndicate Sub-Committee recommended to revise the Scheme and Syllabus of all the Post Graduate Programmes in the University Schools/Departments under Choice Based Credit Semester System (CCSS) with effect from 2015 admission vide paper read (3) above.

3. As per the paper read (4) above, the meeting of the Curriculum Committee recommended certain modifications/ additions to the Regulations for Post Graduate Programmes under Choice Based Credit Semester System and the Regulations were modified in the University w.e.f. 2015 admission vide paper read (5) above.

4. The Department Council vide paper read (6) above has approved the Scheme, Syllabus & Model Question Papers for MCA (3 year) Programme under Choice Based Credit Semester System(CCSS) for implementation with effect from 2015 admission.

5. The HoD, Dept. of Information Technology vide paper read (7) above, has forwarded the Scheme, Syllabus & Model Question Papers for MCA (3 year) Programme in line with the revised Regulations for Choice Based Credit Semester System for implementation with effect from 2015 admission.

P.T.O.

6. 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 KU Act 1996, and all other enabling provisions read together with, has accorded sanction to implement the Scheme, Syllabus & Model Question Papers for MCA (3 year) Programme under Choice Based Credit Semester System, offered in the University Department w.e.f 2015 admission, subject to report to the Academic Council.

7. Orders are, therefore, issued accordingly.

8. The revised Scheme, Syllabus and Model Question Papers of MCA (3 year) Programme effective from 2015 admission are appended.

Sd/-
JOINT REGISTRAR (ACADEMIC)
FOR REGISTRAR

To

The HoD, Department of Information Technology
Mangattuparamba Campus, Kannur University

Copy To:

1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/PA to R/PA to CE/PA to FO
3. JR/AR I Academic
4. The Computer Programmer *(for uploading in the website)*
5. SF/DF/FC

Forwarded/By Order

SECTION OFFICER

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

For more details: log on www.kannur university .ac.in

KANNUR UNIVERSITY

(Abstract)

Master of Computer Applications (MCA) 2 Year Programme (Lateral Entry) under Choice Based Credit Semester System in the University Department– Regulation, Scheme, Syllabus & Model Question Papers Implemented with effect from 2015 admission- Orders issued.

ACADEMIC 'C' SECTION

U.O. No.Acad/C4/ 650/2016 Civil Station P.O, Dated, 25-01-2016

Read: 1.U.O.No.Acad/A2.15374/2011 dated 25.06.2015
2. U.O No.Acad/C3/2049/2009 dated 11.10.2010.
3. U.O No.Acad/C3/2049/2009 dated 05.04.2011.
4. Meeting of the Syndicate Sub-Committee held on 16.01.2015.
5. Meeting of the Curriculum Committee held on 10.04.2015.
6. U.O No.Acad/C4/14536/2014 dated 29.05.2015.
7. Meeting of the Department Council held on 31.07.2015.
8. Letter from the HoD, Dept. of Information Technology, Mangattuparamba Campus

ORDER

1. As per the paper read (1) above, the Vice chancellor has granted permission to start 2 year MCA Programme (Lateral Entry) under CCSS in the University Department of IT w.e.f.2015-16 academic year with an intake of 30 students, retaining the 3 year MCA programme and suspending M.Sc. Computer Science programme w.e.f. 2015- 16 academic year.

2.The Regulations for Post Graduate Programmes under Choice Based Credit Semester System were implemented in the Schools/Departments of the University with effect from 2010 admission as per the paper read (2) above and certain modifications were effected to the same vide paper read (3).

3. The meeting of the Syndicate Sub-Committee recommended to revise the Scheme and Syllabus of all the Post Graduate Programmes in the University Schools/Departments under Choice Based Credit Semester System (CCSS) with effect from 2015 admission vide paper read (4) above.

4. As per the paper read (5) above, the meeting of the Curriculum Committee recommended certain modifications/ additions to the Regulations for Post Graduate Programmes under Choice Based Credit Semester System and the Regulations were modified in the University w.e.f. 2015 admission vide paper read (6) above.

P.T.O.

5. The Department Council vide paper read (7) above has approved the Scheme, Syllabus & Model Question Papers for MCA 2 Year Programme (Lateral Entry) under Choice Based Credit Semester System(CCSS) for implementation with effect from 2015 admission. The course structure and syllabus for the Lateral Entry batch is that of Regular MCA course, (w.e.f. 2015 admission) excluding the first two semesters.

6. The HoD, Dept. of Information Technology vide paper read (8) above, has forwarded the Scheme, Syllabus & Model Question Papers for MCA 2 year Programme (Lateral Entry) in line with the revised Regulations for Choice Based Credit Semester System for implementation with effect from 2015 admission.

7. 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 KU Act 1996, and all other enabling provisions read together with, has accorded sanction to implement the Scheme, Syllabus & Model Question Papers for MCA 2 Year Programme (Lateral Entry) under Choice Based Credit Semester System, offered in the University Department w.e.f 2015 admission, subject to report to the Academic Council.

8. Orders are, therefore, issued accordingly.

9. The revised Scheme, Syllabus and Model Question Papers of MCA 2 Year Programme (Lateral Entry) effective from 2015 admission are appended.

Sd/-
JOINT REGISTRAR (ACADEMIC)
FOR REGISTRAR

To

The HoD, Department of Information Technology
Mangattuparamba Campus, Kannur University

Copy To:

1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/PA to R/PA to CE/PA to FO
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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 2015 admission)

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 2015 admission)

REGULATIONS

1. **Programme Duration** of the MCA programme shall be 3 years, divided into 6 semesters. Each semester should have 18 weeks.

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. **Eligibilityfor admission:** Bachelor Degree with Mathematics/ Statistics/Computer Science/Computer Application/ Engineering and Technology as a main/subsidiary/core/complementary subject of this University or any other University / Institution, recognized by this University as equivalent thereto, with a minimum aggregate of 50% marks or equivalent grade.(For SEBC and Physically Challenged candidates the aggregate marks required is 45%. For SC and ST, a minimum pass in the degree examination is sufficient)

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:** A project work has to be undertaken by all students. The project can be software development following all or some of the software development lifecycle or an R&D project. The hours allotted for project work may be clustered into a single slot so that students can do their work at a centre or location for a continuous period of time. The Project work should be carried out in the Department /Institution or in an Industry / R & D organization of national repute. Project work shall be carried out under the supervision of a Teacher. 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. 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 Department.

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 30 minutes 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)**: All the Heads of the Departments shall submit a confidential panel of examiners for approval. The Vice Chancellor will approve the panel of examiners submitted by the head of the Department. All teachers of the Department will be the members of the Board of Examiners with Head of the Department as the Chairperson. There shall be a minimum of two external examiners also to ensure transparency in the conduct of examinations. The external examiners will be faculty members appointed from other Colleges/Departments of this University or from other Universities. The duration of End Semester Examination shall be specified in the curriculum. The Head of the Department will have to submit to the Controller of Examinations, the details of the core and the elective of each semester along with the syllabus, Model QP and panel of experts for setting the questions, immediately after starting of each Semester. The Controller of Examinations in turn shall set, print and

supply one set of question paper in sealed cover to the Head of the Dept. / Course Director within a maximum of 60 days.

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

6.2Aminimum of grade point5 (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.

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

6.4The 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 **CGPAx10+5**

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

CGPA	**Overall letter grade**
8.5andabove	A
7.5andabovebutlessthan8.5	A
6.5andabovebutlessthan7.5	B

5.5andabovebutlessthan6.5	B
4.5and above but less than 5.5	C

6.7Conversion of Grades into classification

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

6.8Supplementary Examinations for Failed Candidates:

i) Candidates who have failed (Fgrade) in the semester examinations (except project work) can appear for the failed papers for the particular semester along with regular students. However, the Continuous Evaluation (CE) 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, re do the project work and resubmit the project report a fresh for evaluation. The Continuous Evaluation 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 Convener), the Convener of the Curriculum 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.

Kannur University

Department of Information Technology

MASTER OF COMPUTER APPLICATIONS

(LATERAL ENTRY PROGRAMME)

(Choice Based Credit Semester System)

Regulations

(With Effect from 2015 admission)

1. **Programme Duration** of the MCA - Lateral Entry programme shall be 2 years, divided into 4 semesters. The candidates selected will be admitted to the third semester (of regular programme).

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. *Computer science / Application (CORE/MAIN level) : 80%*
ii. *Aptitude and Mental ability* : 20%

3. **Eligibilityfor admission:** Bachelor Degree with Computer Science/Computer Application/ Information Technology as core / main, of this University or any other University / Institution, recognized by this University as equivalent thereto, with a minimum aggregate of 50% marks or equivalent grade.(For SEBC and Physically Challenged candidates the aggregate marks required is 45%. For SC and ST, a minimum pass in the degree examination is sufficient)

4. ***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 Lateral Entry programme is 80 in which minimum credits required for core courses is 60 and for Elective courses is 12. No regular student shall register for more than 24 credits and less than 12 credits per semester.

5. ***Duration:*** The MCA Lateral Entry Programme shall be completed within a minimum of four and maximum of eight 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.

6. **The course structure and syllabus for the Lateral Entry batch is that of Regular MCA course, excluding the first two semesters.**

7. **For matters not covered in this regulation and for course structure and syllabus, please refer to the MCA (CCSS) Regulations, curricula, Syllabus and scheme of evaluation, 2015**

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Course Structure

Semester I

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESE	CE	Tot	
MCA1 C 01	Digital Systems & Introduction to Microprocessors	3	0	0	60	40	100	3
MCA 1 C 02	Introduction to Operating systems & Shell programming	3	0	0	60	40	100	3
MCA 1 C 03	Principles of Programming	4	0	0	60	40	100	4
MCA 1 C 04	Fundamentals of DBMS & RDBMS	3	0	0	60	40	100	3
MCA 1 C 05	Numerical & Statistical Methods	3	0	0	60	40	100	3
MCA 1 P 06	Lab –I (Shell programming / DBMS)	0	4	2	60	40	100	2
MCA 1 P 07	Lab – II (C / numerical Methods)	0	5	3	60	40	100	2
Total		16	9	5				20

Semester II

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESE	CE	Tot	
MCA 2 C 01	Computer Organization	3	0	0	60	40	100	3
MCA 2 C 02	Programming in Java	3	0	0	60	40	100	3
MCA 2 C 03	Introduction to Data Structures using C++	4	0	0	60	40	100	3
MCA 2 C 04	Data communication & computer Networks	3	0	0	60	40	100	3
MCA 2 C 05	Linux System Administration	3	0	0	60	40	100	3
MCA 2 P 06	Lab –III (Data structures/Java)	0	5	1	60	40	100	2
MCA 2 P 07	Lab- IV (C#.NET / LA)	0	4	2	60	40	100	2
MCA 2 C 08	Seminar	0	0	2	0	50	50	1
Total		16	9	5				20

Semester III

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESE	CE	Tot	
MCA 3 C 01	Discrete Mathematics	3	0	0	60	40	100	3
MCA 3 C 02	Computer Networks& Administration	3	0	0	60	40	100	3
MCA 3 C 03	Software Engineering	3	0	0	60	40	100	3
MCA 3 C 04	Advanced Data Structures & Design and Analysis of Algorithms	4	0	0	60	40	100	4
MCA 3 C 05	Advanced DBMS	4	0	0	60	40	100	4
MCA 3 P 06	Lab –V (Ad DBMS / DAA)	0	5	1	60	40	100	2
MCA 3 P 07	Lab- VI (NPA/Web Programming) Web Technology)	0	3	2	60	40	100	2
MCA 3 C 08	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	ESE	CE	Tot	
MCA 4 C 01	Computer Graphics	3	0	0	60	40	100	3
MCA 4 C 02	Advanced Java Programming	3	0	0	60	40	100	3
MCA 4 C 03	Theory of Computation	4	0	0	60	40	100	4
MCA 4 C 04	System software &Advanced Operating System	4	0	0	60	40	100	4
MCA 4 E 05--	Elective – I	3	0	0	60	40	100	3
MCA 4 P 06	Lab –VII (AJP / Graphics)	0	4	0	60	40	100	2
MCA 4 P 07	Lab- VIII (Case study I)	0	4	3	60	40	100	2
Total		17	8	5				21

Semester V

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESE	CE	Tot	
MCA 5 C 01	Principles of Management	3	0	0	60	40	100	3
MCA 5 C 02	Advanced Computer Architecture	3	0	0	60	40	100	3
MCA5 C 03	Windows Programming	3	0	0	60	40	100	3
MCA 5 E 04--	Elective - II	3	0	0	60	40	100	3
MCA 5 E 05--	Elective – III	3	0	0	60	40	100	3
MCA 5 C 06	Communication and Presentation skills	1	0	2	60	40	100	1
MCA 5 P 07	Lab - IX (Windows Programming / Python)	0	4	1	60	40	100	2
MCA 5 P 08	Lab – X Case Study II	0	5	2	60	40	100	2
Total		16	9	5				20

SemesterVI

Subject Code	Subject	*Instructional Hrs/week*			Marks			Credit
		L	P	T	ESE	CE	Tot	
MCA 6 E 01--	Elective - IV	3	0	0	60	40	100	3
MCA 6 E 02--	Elective - V	3	0	0	60	40	100	3
MCA 6 E 03--	Elective - VI	3	0	0	60	40	100	3
MCA 6 C 04	Project	0	16	5	120	80	200	6
MCA 6 C 05	General Viva	0	0	0	60	40	100	2
Total		9	16	5				17

ELECTIVES

Students have to opt for any one stream

STREAM A

Semester	code	Course
4	MCA 4 E 05 A	SIGNALS & SYSTEMS
5	MCA 5 E 04 A	SOFT COMPUTING TECHNIQUES
5	MCA 5 E 05 A	PATTERN RECOGNITION
6	MCA 6 E 01 A	DIGITAL SIGNAL PROCESSING
6	MCA 6 E 02 A	DIGITAL SPEECH PROCESSING
6	MCA 6 E 03 A	NATURAL LANGUAGE PROCESSING

STREAM B

Semester	code	Course
4	MCA 4 E 05 B	ARTIFICIAL INTELLIGENCE
5	MCA 5 E 04 B	SOFT COMPUTING TECHNIQUES
5	MCA 5 E 05 B	PATTERN RECOGNITION
6	MCA 6 E 01 B	DIGITAL SIGNAL PROCESSING
6	MCA 6 E 02 B	DIGITAL IMAGE PROCESSING
6	MCA 6 E 03 B	DATA MINING

STREAM C

Semester	code	Course
4	MCA 4 E 05 C	OBJECT ORIENTED MODELING AND DESIGN
5	MCA 5 E 04 C	SOFTWARE ARCHITECTURE
5	MCA 5 E 05 C	SOFTWARE PROJECT MANAGEMENT
6	MCA 6 E 01 C	SOFTWARE TESTING AND QUALITY ASSURANCE
6	MCA 6 E 02 C	CLOUD COMPUTING
6	MCA 6 E 03 C	OPERATIONS RESEARCH

STREAM D

Semester	code	Course
4	MCA 4 E 05 D	MOBILE COMPUTING
5	MCA 5 E 04 D	SOFT COMPUTING TECHNIQUES
5	MCA 5 E 05 D	INFORMATION SECURITY
6	MCA 6 E 01 D	VISUAL CRYPTOGRAPHY
6	MCA 6 E 02 D	CLOUD COMPUTING
6	MCA 6 E 03 D	CYBER FORENSIC

STREAM E

Semester	code	Course
4	MCA 4 E 05 E	HIGH PERFORMANCE COMPUTING
5	MCA 5 E 04 E	SOFT COMPUTING TECHNIQUES
5	MCA 5 E 05 E	DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS
6	MCA 6 E 01 E	BIG DATA ANLYTICS
6	MCA 6 E 02 E	CLOUD COMPUTING
6	MCA E 03 E	DATA MINING

CORE COURSES

MCA 1 C 01 DIGITAL SYSTEMS & INTRODUCTION TO MICROPROCESSORS

Hours / Week : 3 **Credit : 3**

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.

MCA 1 C 02 INTRODUCTION TO OPERATING SYSTEMS& SHELL PROGRAMMING

Hours / Week : 3 **Credit : 3**

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 CriticalSection 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, Protection & Security.

Unit 5

Shell Basics: Types of shells**,** Shell functionality, Environment, Writing first script, Conditional statements:If-else-elif,Testcommand**,**Logicaloperators-AND,OR,NOT,case-esac,Loops:While,For**,**Until**,**Break&continue,Command line arguments:Positional parameters**,** Set & shift**,** IFS**,** Break & continue ,Functions & file manipulations**,** Functions**,** Regular Expression& Filters: What is regular expression, Grep, cut,sort commands,Grep patterns
Case Study -Linux overview: Kernel Architecture – Process, memory, file and I/O management

Textbooks

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, John Wiley & Sons (ASIA) Pvt. Ltd, Eighth edition, 2005.
2. Unix programming environment,Brian W Kernighan,Rob Pike referances. 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.
4. Dhamdhere, Operating Systems A Concept Based Approach, Second Edition. 5. Flaynn, McHoes, Operating Systems, Cenage Learning, 2006
5. YashwanthKanitkar,"Unix Shell programming", 1stEdition, BPB Publisher, 2010.
6. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1stEdition, Cengage Learning India, 2003.

MCA 1 C 03: PRINCIPLES OF PROGRAMMING

Hours / Week : 4 **Credit : 4**

Unit 1
The Problem -Solving aspect – Top down design – Implementation of algorithms – Properties ofalgorithms – The efficiency of algorithms – Flow chart- Pseudo Code, Programs and Programming Languages - compiler – Interpreter, Loader and Linker - Program execution – Classification of Programming Language-Structured Programming Concept, Features of C, Evolution of C, Structure of a C Program, Compiling a C Program.

Unit 2:
C Character sets-identifiers-data types-keywords-statements- variable and constants- tokens-Operators- Storage classes-auto, register, static, extern, typedef- Type casting, I/O Functions-Control Constructs-Control Statements-Conditional, switch Statements- Loops and Jumping statements - break, continue and goto Statement.

Unit 3:
Introduction to Functions, Function Declaration and Prototypes, Storage Classes,
Recursion inFunction, call by value and call reference. Arrays-One Dimensional Array
Two Dimensional, Multidimensional Array, Searching and Sorting techniques, String operations.

Unit 4:
Understanding memory addresses- address operator- pointer- use of pointers- arrays and pointers – pointers and strings - array of pointers- pointer to pointer- pointers to functions-dynamic memory allocation- memory leak and memory corruption- structures - union-enumeration types- bit fields. Structure Definition-Structure Initialization- Arrays of Structures-Arrays within Structures,Structures within Structures-Passing Structures to Functions-Structure Pointers. Union–Definition and Declaration- Accessing a Union Member-Initialization of a Union Variable- Use of User Defined Type Declarations.

Unit 5
Introduction to File Handling in C- File- Defining and Opening a File- Reading and Writing in Files Reading and writing Data- Sequential File- Functions for Random Access to Files- C preprocessors, macros, undef, scope of macro, line, error, directives-, conditional compilation directives, null directives, command line arguments

Reference Books:

1 R.G.Dromey , How to solve it by computer, Pearson education, fifth edition, 2007.
2. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, 2ndEdn, Pearson Education, 2006
3. S. G. Kochan, Programming in C, Pearson Edn, 4thEdn, 2014.
4. M T. somasekhara, Problem Solving with C, PHI, 2009
5. Balagurusamy, Programming in ANSI C, 5thedn, TMH.
6. Byron Gorrfried, Programming with C, 3rdEdn, Schaum’s outline.

MCA 1 C 04 Fundamentals of DBMS and RDBMS

Hours / Week : 3 **Credit : 3**

Unit 1:
Introduction: Database System Applications, Database Systems versus File Systems, View of Data,Data Models, Schemas, and Instances, DDL, DML, Data Dictionary, Data Integration, Database Access Method, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application Architectures, History of Database Systems, Advantages of Using a DBMS, Spreadsheet Applications.

Unit 2:
The Relational model: Data modeling using Entity Relationship (ER), ER Diagram, Entity sets,attributes and keys, Relationships, Relationship types, roles and structural constraints, Weak Entity types, Specialization and generalization. Relational model concepts, Relational model constraints,Mapping the ER Model to Relational DBs. Case study – Any two database applications.
Database Design: Functional dependencies Basic definitions Trivial and non-trivial dependencies Closure of a set of dependencies Closure of a set of attributes Irreducible sets of dependencies No- loss decomposition and Functional dependencies. First, Second, Third and Fourth Normal Forms, Boyce Codd normal form.

Unit 3:
Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.
SQL: Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, join, Exist, Any, All, joined relations, embedded SQL, QBE.

Unit 4:
Integrity and security: domain constraints, referential integrity, assertion, triggers, authorization in SQL. Views: Introduction to views, data independence, security, updates on views, comparison between tables and views. 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 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 Text:
1. Silbersehatz, Korth and Sudarshan, Database system concepts, 6th edition MGH 2011
2. Ramakrishnan and Gehrke, Database Management Systems, 3rd Edn, McGraw Hill, 2003
3. A Leon & M Leon, Database Management Systems , Leon Vikas – 2003.
4. Elmasri and Navathe, Fundementals of Database systems, 5thEdition ,Pearson 2009
5. O'Reilly, Practical PostgreSQL, ShroffPublishers(SPD) 2002
6. C J Date, An Introduction to Database systems, Pearson, 2004.
7. Cornell, Morris, Mob, Database Systems, Cenage, Learning, 2013
8. M. Gruber, Understanding SQL, Sybex.

MCA 1 C 05 NUMERICAL & STATISTICAL METHODS

Hours / Week : 3 **Credit : 3**

Unit 1

Errors and Approximations, Nonlinear equations – Bisection Method, Regula-FalsiMethod,Secant Method, Newton-Raphson method, Graeffe's Root squaring Method, Muller's Method, Bairstow Iterative Method.

Unit 2

Finite Differences and Interpolation, Interpolation with Unequal-spaced Points, Newton's Fundamental Formula, Lagrange's Interpolation Formula, Inverse Interpolation, Chebyshev Polynomials, Interpolation by Spline Functions.

Unit 3

Eigen values and eigenvectors - Power Method, Jacobi Method, Householder's Method. System of Linear equations- Cramer's Rule, Gauss Elimination Method, Gauss-Jordan Method, Jacobi's Method, Gauss – Seidel method.

Unit4

Numerical Differentiation – Based on equal-interval Interpolation, Derivatives using Newton's backward difference formula, Derivatives using central difference formula(Bessel's and Stirling's formula). Numerical Integration – Trapezium rule, Trapezoidal rule, Simpson's rule, Romberg integration, Gauss quadrature formula.

Unit 5

Differential equations – Preliminaries, Taylor series method, Picard's method, Euler's method, Runge-Kutta methods.Statistical description and modeling of data, Fast Fourier Transform.

References

1. S BalachandraRao, C K Shantha – "Numerical Methods – with Programs in BASIC,FORTRAN,Pascal and C++". University Press

2. Babu Ram –"Numerical Methods", Pearson
3. M.K. Jain, S.R.K. Iyengar, R.K. Jain – Numerical Methods (Problems and Solutions), New Age International Publishers
4. William H. Press, Saul Teukolsky, William T. Vetterling, Brian P. Flannery- Numerical Recipes: The Art of Scientific Computing, Third Edition, Cambridge University Press

MCA 2 C 01 COMPUTER ORGANIZATION

Hours/ week : 3 **Credit : 3**

Unit 1

Basic structure : Basic operational concepts. Number representation and arithmetic operations.Characterrepresentations.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, Hardwired control, CICS style processors (3-bus organization, microprogrammed 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, 6th edn, Tata McGraw Hill.

Reference books:

1. William Stallings, Computer Organization & Architecture – Designing for Performance, 9th Edn, Pearson
2. John P. Hayes, Computer Architecture and Organization, Third Edn, Tata McGraw Hill.
3. M. Morris Mano, Computer System Architecture, PHI 2003

MCA 2 C 02 PROGRAMMING IN JAVA

Hours/ week : 3 **Credit :3**

Unit 1

Object oriented programming, basic concepts of OOP; Introduction to Java programming, features of Java: - Bytecode, Java Virtual Machine (JVM), Java Applets and Applications, Java file name and directory structure; Packages of Java API. Data Types, Variables, and Arrays, Type Conversion and Casting; Operators; Control Statements.

Unit 2

Class, Class Fundamentals, Declaring Objects, Constructors, access specifier, static, Nested and Inner Classes, Command-Line Arguments, this Keyword; Garbage Collection. String handling.Collection class.Inheritance, method overloading, Method Overriding, Dynamic Method Dispatch, Abstract Classes.

Unit 3

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. : I/O Streams,File Input Stream and File Output Stream,Data Input and O/P Streams,Buffered I/P and O/P Streams,FileClass,Reader and Writer Streams,Random Access File.

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, Event Listener Interfaces, Adapter Classes. Java database connectivity:- JDBC architecture- drivers- database connections- statements- resultsets- transactions-metadata-stored procedures-error handling- blobs and clobs.

Reference books:

1. Herbert Schildt, The complete reference Java2 ,7thed, Mc, Graw Hill.
2. David Flanagan, Java in a Nutshell A desktop quick Reference, 2 Edition, OReilly&AssociatesInc
3. Rajkumar, Java programming, pearson, 2013
4. HarimohanPandey, Java Programming, Pearson, 2012

5. Sha and Sha, Core Java for beginners, ShroffPubl and dist, 2010
6. Rasdhakrishnan, Object Oriented Programming through Java, University Press, 2007
7. Deital and Deital, Java for Programmers, 2ndEdn, Person.

MCA 2 C 03 INTRODUCTION TO DATA STRUCTURES USING C++

Hours/ week : 4 **Credit : 3**

Unit 1

Introduction to OOP – overview of C++,Class, Object, inline functions, constructors, destructors, scope resolution operator, friend functions, friend classes, static members, *this* pointer, references, dynamic memory allocation. Function overloading, overloading constructors, pointers to functions, Operator overloading

Unit2

Inheritance, types of inheritance, protected members, virtual base class, polymorphism, virtual functions, pure virtual functions.

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).

Unit3

Abstract Data Types (ADT)**,** Algorithm analysis, Asymptotic notations - Big Oh

Arrays – representation.

Representation of Polynomials with arrays – Representation of sparse polynomials – sparse polynomial evaluation and addition.

Matrix operations – inverse. Sparse matrix representation - transpose of sparse matrix, sparse matrix addition.

Searching – Sequential and Binary, Sorting – Insertion, selection, bubble. Counting sort.

Unit 4

Linked list – Singly linked list (SLL) – basic operations (create list, add/delete nodes, traverse/print, search SLL, concatenate), Circular SLL – operations (add/delete nodes, print, concatenate, search). LL with header/trailer nodes. Doubly Linked List – basic operations (create list, add/delete nodes, traverse/print).

Stack – array and Linked List implementation – applications – infix to postfix conversion – evaluation of postfix.

Queue – array and Linked implementation – Circular queue (array based).

Unit 5

Non-linear data structures – tree and binary tree– basic definitions and properties –function to create binary tree - traversal – recursive, count number of nodes, array based binary tree function to create a complete tree..

Applications of trees – decision tree, game tree.

String – representation, basic string operations, pattern search.

Reference Books:

1. Horowitz, Sahni and Mehta, Fundamentals of Data Structures in C++, 2nd Edn, University Press
2. Horowitz, Sahni, Rajasekaran, Fundamentals of Algorithms, 2nd Edn, University Press
3. M. A. Weis, Data Structures and Algorithm Analysis in C++, Pearson Education Asia, 2013
4. Langsam, Augenstein and Tenenbaum, Data Structures Using C and C++, 2nd edn, PHI.
5. Anany Leviton, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education.
6. Aho, Hopcroft and Ullman, Data Structures and Algorithms, Pearson Education.
7. Schildt, C++ - The complete Reference, 4th edn, McGraw Hill.
8. Somashekara, Guru, Nagendrasamy, Majunath, object Oriented Programming with C++, 2nd edn PHI
9. BjarneStroustrup - The C++ Programming language, Addison Wesley , 3rd Ed.

MCA 2 C 04 DATA COMMUNICATION AND COMPUTER NETWORKS

Hours/ week : 3 **Credit : 3**

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, EIA232interface, 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

MCA 2 C 05 LINUX SYSTEM ADMINISTRATION

Hours/ week : 3 **Credit : 3**

Unit l

Introduction: Various parts of operating system: kernel, system programs, and application programs; system calls; Important parts of kernel; Major services in a UNIX system: init, login from terminals, syslog, periodic command execution crown and at; Graphical user interface; Bourne shell scripts: scripts execution, permissions and file magic, variables and parameters, inherited environment, if else elsif constructs, conditional test, case statement, for construct.

Unit 2

The LILO boot process: LILO parameters, /etc/lilo.conf; loadlin; The /boot directory and files; initrd file and mkinitrd; Run levels: /etc/inittab, start-up script /etc/re.d/rc.sysinit; System initialization scripts: /etc/rc.d/rc.serial, /etc/re.d/rc.local, /etc/issue, /etc/issue.net, /etc/re.d/init.d/... scripts operation, starting X windows automatically.

Unit 3

System Configuration: The /etc/sysconfig/... files used in network setup: /etc/sysconfig/network-scripts/ files (parameter files and scripts), /etc/sysconfig/files for clock, mouse, static-routes, keyboard, network and pcmcia; kernel modules; kernel daemon; /etc/conf.modules and module parameters; /lib/modules/... directory structure and contents.File system configuration: file system types, /etc/fstabloyout and meaning; Basic user environment: /etc/skel/... and home directories, Window manager configuration file locations;

Unit 4

System Security: Host security: tcp_wrappers and /etc/hosts.allow and /etc/hosts, deny, /etc/security, shadow password, file permissions, users groups and umask; Adding and deleting users; Printing: /etc/printcap file, adding local and remote printers, /etc/hosts.Ipd file, print filter system for local printers, using Ipc, Ipq and Iprm;

Unit 5

System maintenance: Syslogd, klogd and /etc/syslog.conf; Using a remote syslog; The system crontab,

dailyscript, tmpwatch and logrotate; Using and managing the system log files; Basic system backup and restoreoperations; Emergency rescue operations; Basic shell configuration for Bourne and bash shells: /etc/bashrc,/etc/profile, -/.bashrc, ~/.bash_profile, -/.profile.

Reference books:

1 Evi Nemeth, et al Linux Administration Hand Book, PHI 2003
2 Essential system Administration, O Rielly&Associates, inc
3 John hein , The Linux companion for System administration Addison Wesly
4 Nicholas Wells Linux Installation and Administration, Thomson Vikas

MCA 3 C 01 DISCRETE MATHEMATICS

Hours/ week : 3 **Credit : 3**

Unit 1

Propositional Logic: Basic logical operations, conditional statement, bi-conditional statement, converse, inverse and contrapositive statement, well-formed formula, tautology, contradiction, equivalence of formula, laws to determine equivalence, tautological implication, duality law, normal forms- (CNF, DNF, PCNF, PDNF), Predicate calculus- rules of inference, valid arguments, types of quantifiers, properties of quantifier.

Set Theory: Set, types of set, operations and laws, algebra of sets and duality, inclusion and exclusion principle, Cartesian product

Unit 2:

Mathematical Induction and Peano axiom

Relations: Definition, properties of relation, set operations on relation, types of relation, equivalence class, relation matrix and graph of relation, partition and covering of set, poset, composition of relation, recurrence relation

Functions: Basic definition, types of function, invertible function, identity function, composition of function.

Unit 3

Combinatorics: Basics of counting, pigeon hole principle, permutation and combination.

Lattice: Totally ordered set, product set and partially ordered relation, hasse diagram of poset, lattice as a poset, duality of lattice, types of lattices.

Binary Operations: Properties of binary operation, group, properties of group, modulo operations, permutation group, cyclic group, subgroup, coset, semigroup, monoid, ring, field.

Unit 4

Probability: Preliminary concept- experiment, random experiment, event(simple and compound), sample space, mutually exclusive event, exhaustive event, impossible event, complement of an event, equally likely event, definition and types of probability- classical approach, axiomatic approach, frequency approach, addition theorem, independent and dependent events, condition probability, multiplication theorem, Bayes theorem.

Random Variable- Discrete random variable, probability distribution of discrete random variable,; Joint Distribution- conditional probability distribution, independent random variable, marginal distribution function, conditional probability density function

Unit 5

Graph theory- Basic terminology, path, cycle, connectivity, subgraph, types of graph, isomorphic graph, representation of graphs in computer memory- adjacency matrix, incidence matrix, circuit matrix, cut set matrix; Eulerian and Hamiltonian graph, operations on graph- union, intersection, complementation, product, composition of graph, fusion of graphs.

Tree: Basic terminology, properties of tree, pendant vertex in a tree, binary tree, complete binary tree, full binary tree, minimal spanning tree- Prims algorithm, Kruskal's algorithm

Reference Books

1. J.P. Tremblay, R. Manohar- Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill
2. Kenneth H Rosen - Discrete Mathematics and its Applications with Combinatorics and graph Theory, Seventh Edition, McGraw Hill
3. Walpole, Myers,Ye- Probability and Statistics for Engineers and Scientists, Pearson Edition
4. NarsinghDeo- Graph Theory with applications to computer science engineering and technology, Prentice-Hall of India

MCA 3 C 02 COMPUTER NETWORKS AND ADMINISTRATION

Hours/ week : 3 **Credit : 3**

Unit 1

The LILO boot process: LILO parameters, /etc/lilo.conf; The /boot directory and files; initrd file and mkinitrd; Run levels: /etc/inittab, start-up script /etc/rc.d/rc.sysinit; System initialization scripts: /etc/rc.d/rc.serial, /etc/rc.d/rc.local, /etc/issue, /etc/issue.net, running X Windows automatically- System Configuration : The /etc/sysconfig/... files used in network setup: /etc/sysconfig/network-scripts/ files (parameter files and scripts), /etc/sysconfig/files for clock, mouse, static-routes, keyboard, network and pcmcia kernel modules; kernel daemon; /etc/conf. modules and module parameters; /lib/modules/... directory structure and contents. File system configuration: file system types, /etc/fstab layout and auto mounting options;

Unit 2

System Security: Host security: tcp_wrappers and /etc/hosts.allow and /etc/hosts. deny, /etc/security, shadow password, file permissions, users groups and umask; Account management; ; Printing: /etc/printcap file, adding local and remote printers, /etc/hosts.Ipd file, print filter system for local printers,

using Ipc, Ipq and Iprm; System maintenance: Syslogd, klogd and /etc/syslog.conf; Using a remote syslog; The system crontab, dailyscript, tmpwatch and logrotate; Using and managing the system log files; Basic system backup and restore operations; Emergency rescue operations. Introduction to Linux Kernel; Configuration facilities; System call, Working getpid, nice, pause, fork, execv, exit, wait, Implementing new system calls

Unit 3

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; Introduction to Socket Programming: Sockets and Port numbers, socket address structure
Byte ordering functions, | Address conversion routines,Socket System calls-Client server computing: Architecture types of servers and mode operations, Implementation of client-server programs using TCP/UDP protocols and unreserved ports.

Unit 4

TCP / IP Network Configuration: Introduction to TCP / IP network, Protocols, IP address and Hostname – Network Interface configuration; The SLIP and PPP interface, Configuring Gateway, Routing through gateway, Network commands: ping, ifconfig, netstat, route. Network applications Configuration: File Transfer Protocol (FTP) and Trivial File Transfer Protocol (TFTP), Network File Systems (NFS) . Network Information System(NIS),Hyper Text Transfer Protocol (HTTP) and Web server, Server Message Block (SMB) Protocol and Samba server, Dynamic Host configuration Protocol (DHCP)

Unit 5

Domain Name Services (DNS) and Mail services: working of DNS, Host name Resolution Namelookup 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. Simple Mail Transfer Protocol (SMTP), Post office
Protocol(POP) Multipurpose Internet Mail Extension (MIME), SMTP and POP3 command, Mail routing, Configuring A mail server.

Reference Books

1.Evi Nemeth ., et al, Linux Administration Hand Book , PHI 2003(Unit 1,Unit 2,Unit 4 & Unit 5)
2.Essential system Administration Handbook, PHI(Unit 1,Unit 2,Unit 4 & Unit 5)
3. John Hein The Linux Companion for system AssisonWesly (Unit 1, Unit 2, Unit5)
4. M beck, Linux Kernel Internals, Second edition, Addison Wesley. 1998(Unit 2)
5.OlafKrich and Terry Dawson, Linux Network Administrators Guide. O'relly(Unit 4 and Unit5)
6. W Richard Stevens, Unix Network Programming, PHI, 2002 (Unit 3)

MCA 3 C 03 SOFTWARE ENGINEERING

Hours/ week : 3 **Credit : 3**

Unit 1

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

Unit 2

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Validating Requirements.Requerments Modeling: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class – Based Modeling.

Unit 3

Requirements Modeling: Requirements Modeling Strategies, Flow-Oriented Modeling. Design Concepts: Design Within the Context of Software Engineering, The Design Process, Design Concepts. Architectural Design: Software Architecture - What is Architecture?, Why is Architecture Important? Architectural Styles, Architectural Design

Unit 4

Component-Level Design: What is a Component?, Designing Class-Based Components. User Interface Design: The Golden Rules, User Interface Analysis and Design. Software Configuration Management, The SCM Repository, The SCM Process.

Unit 5

Software Testing: A Strategic Approach to Software Testing, Testing Conventional Applications - Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Emerging trends in Software Engineering - Future Technology Directions

Text Book

Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7 th Edition, McGraw-Hill International Edition, 2010.

Reference Books

1. Richard Fairey, 'Software Engineering concepts, Tata McGraw-Hill 2009 reprint

2. Ian Sommerville, 'Software Engineering'. 6th Ed., Addison Wesley

3. Waman S Jawadekar, 'Software Engineering Principles and Practice', Tata McGraw Hill, 2004

MCA 3 C 04 ADVANCED DATA STRUCTURES & DESIGN AND ANALYTSIS OF ALGORITHMS

Hours/ week : 4 **Credit : 4**

Unit 1

Abstract Data Types (ADT)**,** Algorithm analysis, Asymptotic notations.

Arrays – representation.

Sparse matrix representation with arrays – operations (multiplication)
Linked list – Singly linked list (SLL) – basic operations, search, merge, reverse, concatenate, Circular SLL – basic operations, Queue with circular LL, LL with header/trailer nodes. STACK with SLL & header node, Doubly Linked List – basic . Polynomials with SLL – addition and evaluation.
sparse Matrix with LL – operation (add).
Recursive functions – recursive to iterative - analysis of recursive functions.
Applications of stack and queues.

Unit 2

Non-linear data structures – tree and binary tree– –function to create binary tree - non-recursive tree traversal, operations with binary tree 9merge, split, copy, print level-by-level).
Threaded binary tree(TBT) – inorder threaded BT and function for inorder traversal of Inorder TBT.
Binary search tree – create - add/delete nodes – search. Applications of trees.
AVL trees –basic concepts, insertion and deletion operations.

Unit 3

B- trees- basic concepts, insertion and deletion operations., red black trees- basic concepts, insertion and deletion operations.
splay trees - basic concepts only. Trie – basic concept only.
Hashing - Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing – Multiple hashing..
Graph - Definitions – Representation of graph.

Unit 4

Algorithms - Divide and Conquer –selection, Merge Sort, Quick sort.
Sort algorithms – heap, shell, radix. Comparison of sort algorithms.
Implementation of priority queue.

Unit 5

Greedy algorithm – Knap sack, Prim's and Kruskal's algorithm.
Dynamic programming – 0/1 knap sack, all-pairs shortest, single source shortest.
Backtracking – Sum of Subset Problem.
Parallel algorithms (basic concepts only)
Lower bound theory – Np – Hard and Np – Complete problems (basic concepts only).

Reference Books:

1. Horowitz, Sahni and Mehta, Fundamentals of Data Structures in C++, 2nd Edn, University Press
2. Horowitz, Sahni, Rajasekaran, Fundamentals of Algorithms, 2nd Edn, University Press
3. M. A. Weis, Data Structures and Algorithm Analysis in C++, Pearson Education Asia, 2013
4. Langsam, Augenstein and Tenenbaum, Data Structures Using C and C++, 2nd edn, PHI.
5. Anany Leviton, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education.
6. Aho, Hopcroft and Ullman, Data Structures and Algorithms, Pearson Education.

MCA 3 C 05 ADVANCED DBMS

Hours/ week : 4 **Credit : 4**

Unit 1

Database-System Architectures – Centralized, Client–Server and Server System Architectures – Parallel and Distributed Systems.Parallel Databases - I/O Parallelism – Interquery, Intraquery, Intraoperation and Interoperation Parallelism - Design of Parallel Systems.Distributed Databases - Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions - Commit Protocols -Concurrency Control in Distributed Databases - Distributed Query Processing - Heterogeneous Distributed Databases.

Unit 2

Data Analysis and Mining - Decision-Support Systems - Data Analysis and OLAP - Data Warehousing -Data Mining. Information Retrieval - Relevance Ranking Using Terms - Relevance Using Hyperlinks -

Synonyms, Homonyms and Ontologies - Indexing of Documents - Measuring Retrieval Effectiveness - Web Search Engines - Information Retrieval and Structured Data.

Unit 3

Object-Based Databases - Complex Data Types - Structured Types and Inheritance in SQL – Table Inheritance - Array and Multiset Types in SQL - Object-Identity and Reference Types in SQL - Implementing O-R Features - Persistent Programming Languages - Object-Oriented versus Object-Relational models

Unit 4

Advanced Data Types and New Applications - Time in Databases - Spatial and Geographic Data - Multimedia Databases - Mobility and Personal Databases. Advanced Transaction Processing - Transaction-Processing Monitors - Transactional Workflows - E-Commerce - Main-Memory Databases – Real-Time Transaction Systems - Long-Duration Transactions - Transaction Management in Multidatabases.

Unit 5

Emerging database technologies and applications: Mobile databases, Multimedia databases, Geographic Information Systems, Genome Data Management.

Reference Books

1. Silbersehatz, Korth and Sudarshan, Database system concepts, 6th edition MGH 2011
2. Ramakrishnan and Gehrke, Database Management Systems, 3rd Edn, McGraw Hill, 2003
3. A Leon & M Leon, Database Management Systems , Leon Vikas – 2003.
4. Elmasri and Navathe, Fundamentals of Database systems, 5th Edition,Pearson 2009

MCA 4 C 01 COMPUTER GRAPHICS

Hours/ week : 3 **Credit : 3**

Unit 1

Overview of Graphics systems: Video display devices, Raster scan systems, Graphic workstations and viewing systems, Input devices, Graphics software, introduction to OpenGL.

Graphics Output Primitives:Coordinate reference frames, Line drawing algorithms (DDA and Bresenham's), OpenGL curve functions, Circle generating algorithms (Midpoint circle), Pixel addressing and Object geometry, fill area primitives, Polygon fill areas.

Unit 2

Attributes of graphics primitives : Color and Gray scale, point attributes, Line attributes, Fill-Area attributes, General Scan-line polygon fill algorithm, Scan-Line fill of convex-polygons, Boundary fill and flood fill algorithms, Antialiasing.

Two-dimensional viewing : 2D viewing pipeline, Clipping window, normalization and viewport transformation, Clipping algorithms, point clipping, line clipping (Cohen-Sutherland, Nichol-Lee-Nichol), Polygon Fill-area clipping (Sutherland – Hodgeman).

Unit 3

Geometric Transformations: Basic 2D transformation, Matrix representation and Homogeneous coordinates, Inverse transformations, 2D composite transformations, Reflection and shear, Raster methods for geometric transformations, Transformations between 2D coordinate systems. 3D Geometric transformations, 3D translation, 3D rotation (coordinate axis rotation, General 3-d rotation, Quaternion methods for 3D rotation), 3D scaling, 3D composite transformations, transformations between 3D coordinate systems.

Unit 4

Three-dimensional viewing : Overview of 3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, orthogonal projections (axonometric and isometric, orthogonal projection coordinates, clipping window and orthogonal projection view volume, Normalization transformation), Oblique parallel projections (Cavalier and cabinet projections, Clipping window and Oblique parallel-projection view volume, Oblique parallel projection transformation matrix, normalization transformation), Perspective projections (transformation coordinates, perspective-projection equations, vanishing points, view volume, transformation matrix, symmetric and oblique perspective-projection frustum, Normalized perspective-projection transformation coordinates), 3D clipping algorithms (region codes, point and line clipping, polygon clipping)..

Unit5

3D Object representation : Quadric surfaces, superquadrics, spline representations.

Visible surface detection methods : Classification, Back-face detection, depth-Buffer method, A-buffer method. Wireframe visibility methods.

Illumination models and surface rendering methods : Light sources, Surface lighting effects, Basic illumination models (Ambient light, Diffuse reflection, Specular reflection and the Phong model), polygon rendering methods (constant intensity surface rendering, Gouraud surface rendering, Phong surface rendering), Ray tracing methods – basic Ray-tracing algorithm.

Text Book :

1. Hearn and Baker, Computer Graphics with OpenGL, 3rdedn, Pearson.

Reference Books:

1. Hill Jr. and Kelly, Computer Graphics using OpenGL, 3rdEdn, Pearson
2. Shreiner, Sellers, Kessenich, Licea-Kane, OpenGL programming guide, 8thedn, Pearson.
3. Foley, Van Dam, Feiner, Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education.

MCA 4 C 02 ADVANCED JAVA PROGRAMMING

Hours/ week : 3 **Credit : 3**

Unit 1

Java Servlets: life cycle; http servlets, post, head and other requests; Servlet responses; error handling; security; servlet chaining; thread safety; cookies; session tracking; httpsessionbinding listener; databases and non-html content.

Unit 2

Remote Method Invocation: RMI architecture; RMI object services; defining remote objects; key RMI classes for remote object implementations; stubs and skeletons; accessing remote object as a client; factory classes; dynamically loaded classes; configuring clients and servers for remote class loading; remote object activation, persistent remote references; defining an activatable, remote object, activatable class, implementing an activatable object, registering activatable objects, passing data with the marshalled object; activation groups, registering activation groups, assigning activatable objects to groups; activation daemon. CORBA: architecture, IDL, creating CORBA objects, registering with naming service, finding and using remote objects.

Unit 3

Java Naming and Directory Interface: JNDI Architecture, Context, initial context class, Looking up Object in a context, Listing the children of a context, Creating and destroying the object, binding objects -accessing directory services, modifying directory entries, creating directory entries, searching a directory, Event notification.

Unit 4

Enterprise JavaBeans: EJB roles-ELB client-Object –container-Transaction management-implementing a Basic EJB Object- Implementing session Beans, Implementing Entity Beans-Deploying an enterprise Java Beans Object- Changes in EJB1.1 specification.

Unit 5

JavaServer Pages: JSP basics, directives and declarations, sharing data between JSPs, JSP actions, JSP application development: Generating dynamic content, using scripting elements implicit JSP Objects, Conditional processing- Displaying values using an expression to set an attribute, Declaring variables and Methods Error Handling and Debugging sharing data between JSP pages, Requests, and users passing.

Reference books:

1. David Flanagan,Jim Parley, 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. JaisonHunder& William Crawford, Java Servlet Programming, O'REILLY, 2002
4. Kogent Learning Solutions Inc. --Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJA

MCA 4 C 03 THEORY OF COMPUTATION

Hours/ week : 4 **Credit : 4**

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.

Finite automata: Deterministic Finite Acceptors, Nondeterministic Finite Acceptors, Equivalence of deterministic and nondeterministic finite acceptors, Reduction of the number of states in finite automata.

Unit 2

Regular Languages and Regular grammars :Regular expressions, connection between regular expressions and regular languages , regular grammars

Properties of Regular Languages:closure properties of regular languages, identifying non regular language.

Context-free grammars & languages Context-free grammars, parsing and ambiguity.

Unit 3

Simplification of Context free Grammars and Normal forms : methods of transforming grammars, two important normal forms.

Pushdown automata for context-free languages Non deterministic pushdown automata, PDA and context-free languages, deterministic pushdown automata and deterministic context-free languages.

Unit 4

Properties of Context-Free Languages: pumping lemmas for context free languages and linear languages, closure properties for context-free languages.

Turing machine Standard Turing machine, combining Turing machines for complicated tasks, Turing's thesis

Unit 5

Other models of Turing machine : Minor variations on the Turing machine theme, Turing machine with complex storage, nondeterministic Turing machine, a universal Turing machine, Linear bounded automata.

Limits of Algorithmic computation: Problems that cannot be solved by Turing machines, Undecidable Problems for Recursively enumerable Languages, The Post Correspondence problem.

Text Book :

1. An introduction to Formal Languages and Automata, Peter Linz, 4thedn, Narosa publishing House.

Reference Books

1. John C Martin, Introduction to Languages and the Theory of Automata, McGraw Hill 1997

2. Mishra &Chandrasekharan, Theory of Computer Science : Automata, Languages and Computation, 3rd edn, PHI
3. Hopcroft, Motwani and Ullman, Introduction to automata theory, Languages and Computation, 3rd Edn,., Pearson

MCA 4 C 04 SYSTEM PROGRAMMING &ADVANCED OPERATING SYSTEMS

Hours/ week : 4 **Credit : 4**

Unit 1

System programming – Assemblers, linkers, loaders and compiler (basic ideas).

Introduction to compilers: Different Phases. Lexical Analysis:role of the lexical analyzer, input buffering, specification of tokens, Recognition of tokens**.**

Syntax Analysis: role of the parser Context free grammar, writing a grammar, Top down parsing,Recursive descent parsing, Predictive parsing.

Unit 2

Bottom Up Parsing, Shift Reduce parsing, Operator precedence parsing, LR parsers (SLR, Canonical and LALR).

Syntax-directed translation – Syntax-directed definitions: S-attributed definition, L-attributed definition. Top-down and bottom-up translation, Type checking

Unit 3

Run time Environment: source language issues, storage organization - Storage organization schemes, Activation records. Storage allocation strategies (basic concepts only), Parameter passing mechanisms, .Symbol tables.

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

Unit 4

Distributed Operating Systems- Motivation, types of network based operating system, distributed systems robustness, design issues.

Distributed File System- Naming and transparency, remote file access, stateful v/s stateless services, file replication.

Unit 5

Distributed Synchronization—event ordering, mutual exclusion, atomicity, concurrency control, deadlock handling, election algorithms, reaching agreement.

Real Time Systems- Characteristics, features of real time kernels, implementation, real time CPU scheduling.

Features of real time linux.

Text Book:

1. Silberschatz, A., Galvin, P.B. & Gagne, G. "Operating System Concepts", 8th Ed. Wiley- India.
2. D.M. Dhamdhere, "Systems Programming and Operating Systems", TMH, 2003.
3. 2. A.V. Aho, R. Semi, J.D. Ullman, "Compilers - Principles, techniques and tools", Pearson Education, 2003

References:

1. Dhamdhere, D. M. "Operating Systems", 2nd Ed. The McGraw - Hill Companies.
2. Kochan, S, G., Wood, P., "Unix shell programming", 3rd ed. Pearson Education, 2003
3. Ditel, Deital and Choffness, Operating Systems, Pearson, 3rdEdn
4. .A.V. Aho and J.D. Ullman, " Principles of Compiler Design", Narosa, 2002
5. Kenneth.C.Louden, Compiler Construction:Principles And Practice, Thomson Learning, India
6. Dave and Dave, Compilers – principles and practice, pearson, 2012
7. Appel, Modern Compiler Implementation in C, Cambridge , 2012

MCA 5 C 01 PRINCIPLES OF MANAGEMENT

Hours/ week : 3 **Credit : 3**

Unit 1

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

Unit 2

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

Unit 3

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

Unit 4

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

Unit 5

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

References

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

MCA 5 C 02 ADVANCED COMPUTER ARCHITECTURE

Hours/ week : 3 **Credit : 3**

Unit 1

Introduction to parallel processing- Trends towards parallel processing, Parallelism in uniprocessor systems, Parallel computer structures, Architectural classification schemes, Parallel processing applications. **Principles of scalable performance**- Performance metrics and measures, Parallel processing applications, Speedup performance laws, Scalability analysis and approaches.

Unit 2

Principles of Pipelining and vector processing- Pipelining: an overlapped Parallelism, Instruction and arithmetic pipelines, Principles of Designing pipelined processors, Vector processing requirements. **Instruction level parallelism**- Basic design issues, Problem definition, Model of a typical processor, Compiler detected instruction level parallelism, Operand forwarding, Reorder buffer, Register renaming, Tomasulo's algorithm, Branch prediction, Limitations in exploiting instruction level parallelism, Thread level parallelism. **Case study**: Pentium, Ultra SPARC.

Unit 3

Structures and algorithms for array processors- SIMD array processors, SIMD interconnection networks, Parallel algorithms for array processors, Associative array processing. **SIMD computers and performance enhancement** – Review of SIMD computers, The massively parallel processor, Performance enhancement methods. **Case study**: Illiac-IV, BSP.

Unit 4

Multiprocessor architecture and programming –Functional structures, Interconnection networks, Parallel memory organizations, Multiprocessor operating systems, Concurrency for multiprocessing. **Multiprocessing control algorithms**- Interprocess communication mechanisms, System deadlocks and protection, Multiprocessor scheduling strategies, Parallel algorithms for multiprocessors. **Example multiprocessor systems** - Exploratory and commercial multiprocessors.

Unit5

Data flow computers and VLSI computations – Data-Driven computing and languages, Data flow computer architectures, VLSI computing structures, VLSI matrix arithmetic processors.

Text Book:

1. Hwang, K., Briggs, F.A. "Computer Architecture and Parallel Processing.", McGraw Hill International Editions.
2. Hwang, K., Jotwani, N. "Advanced Computer Architecture.", 2nd Ed., Tata McGraw Hill Education Pvt. Ltd., New Delhi.

Reference:

1. Hennessy, J.L., Patterson, D.A. "Computer Architecture – A Quantitative Approach.",3rd Ed., Morgan Kaufmann.

MCA 5 C 03 WINDOWS PROGRAMMING

Hours/ week : 3 **Credit : 3**

Unit 1

Introduction to VC++ and MFC: Integrated development environment, resource editor, esource files, Application wizard and class wizard, message handling, Understanding tools in VC++, writing simple programs in VC++, DLL and API,Messages, Components, User, GDI and kernel, MFC fundamentals, Structure of MFC applications, Creating Main window using MFC ,Processing messages.

Unit 2

Windows basic controls and classes: Message box, Menus, Basic SDI classes, Application class, Document class, View class, Mainframe Class. CframeWnd and Message maps, Menu message handler and Timer settings, CMenu, Object and functions, CWind( ), Childfmmdsws, CWind::create( ), dialogues and common dialogue classes, Static controls and Dynamic controls, Message handling with controls, List box, Combo box and Edit controls, Operations and messages for win3.1 common controls, Writing simple dialog based program, Data transfer function, DDV functions, Cstring, Commuaication between dialogs, Modal and Modeless dialogs,CcmdUI

Unit 3

Graphics and text drawing: GDI and device context, GDI object and device context settings,stock drawing objects,pen,brush and RGB macro, CDC classes and examples, setViewportOrg( ), CClientDC object, setROP2(), OnPaint(), setting text, background colour and background display mode, fast drawing and bit map graphics. Advanced Windows Controls and Multitasking : More common controls, Updown controls spin controls, slider controls, progress bar, tool bar, status bar, tree views and calendar controls, property sheets and wizards, thread basics, multiple threads, suspending and resuming threads, synchronization, semaphore, event objects, CCriticalSection and Timed Lock Request.

Unit 4

Document View Architecture: Introduction, document view frame work (4 classes), Initializing application, storing and retrieving documents, CDocument and CView class, OnDraw( ), Document template, RUNTIME_CLASS macro, application wizard, class wizard, adding message handler using class wizard, designing user interface, printing the view, serialization and CArchieve, splitter windows and filing, Collection classes, MDI application, CForm View class, form program.

Unit5

ActiveX controls and ODBC classes : ActiveX and OLE, COM and COM interface, MFC and ActiveX, ActiveX projects, ActiveX control program and control properties, stock caption properties,

ActiveX methods, stock DoClick methods, ActiveX events, ActiveX control containers. ODBC classes: ODBC, Database drivers, DSN, connecting VC++ program to remote database. CDatabase class, open, close, CRecordSet class, establishing connection, Movefirst, Movenext,Movelast, Moveprev functions, adding, editing and deleting records, Edit, AddNew and Update functions, sorting and filtering records, m_strSort and m_strFilter variables, create simple database editing programs.

Reference books:

1. Shirley Wodtke, MFC C++ classes, 1997 2. John Paul Muller, Visual C++ from the Group-TMGH 1998.
3. Herbert Schildt, MFC programming,1996
4. Robert D. Thompson, MFC programmersrefernce, 1998
5. Michael J. Young, Mastering Visual C++ 6.0,2000.

ELECTIVE COURSES

MCA 4 E 05 A SIGNALS & SYSTEMS

Hours/ week : 3 **Credit : 3**

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

MCA 5 E 04 A/B/D/E SOFT COMPUTING TECHNIQUES

Hours/ week : 3 **Credit : 3**

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)

Unit5

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

MCA 5 E 05 A/B PATTERN RECOGNITION

Contact Hours/ week : 3 **Credit : 3**

Unit 1

Pattern Classifier – Over view of Pattern recognition – discriminant functions - Supervised learning - Parametric estimation – Maximum Likelihood estimation - Bayesian Parametric estimation – Perceptron Algorithm – LMSE algorithm – Problems with Bayes approach – Pattern classification by Distance functions- minimum distance Pattern classifier.

Unit 2

Unsupervised classifications - clustering for unsupervised learning and classification – Clustering concept – C means algorithm – Hierarchical clustering procedures – Graph theoretic approach to pattern clustering – Validity of clustering solutions.

Unit 3

Structural Pattern recognition - Elements of formal Grammars – String generation as Pattern description – Recognition of syntactic description – Parsing – Stochastic Grammars and Applications – Graph based structural representation.

Unit 4

Feature extraction and selection –Entropy minimization – Karhunen – Loeve Transformation – Feature selection through functions approximation – Binary feature selection.

Unit 5

Recent Advances- Neural network structures for Pattern Recognition - Neural networkbased pattern associators- Unsupervised learning in Neural Pattern Recognition - Self organizing networks - Fuzzy logic- Fuzzy pattern classifiers – Pattern classification using Genetic algorithms.

Reference Books:

1. R. J. Schalkoff, Pattern Recognition : Statistical, Structural and Neural approaches, Wiley Student Edn, 1992.
2. Tou and Gonzalez, Pattern Recognition Principles, Addison Wesley, 1974.
3. Duda, Hart and Stork, Pattern Classification, 2nd Edn, John Wiley and Sons
4. Morton Nadler, Eric P Smith, Pattern Recognition Engineering, Wiley, 1993.

MCA 6 E 01 A/B DIGITAL SIGNAL PROCESSING

Hours/ week : 3 **Credit : 3**

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. SanjitK.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

MCA 6 E 02 A DIGITAL SPEECH PROCESSING

Hours/ week : 3 **Credit : 3**

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 Book:

1. Lawrence Rabiner, Biing-Hwang Juang, Fundamentals of Speech Recognition,Prentice Hall.
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing- John Willey & sons, 2011.
3. L R Rabiner and Schafer , Digital processing of speech signals, Prentice hall. 1978.
4. Jurafsky and Martin, Speech and Language Processing – An introduction to Natural Language Processing, Computational Linguistics, and Speech recognition, 2013, Pearson

MCA 6 E 03 A NATURAL LANGUAGE PROCESSING

Hours/ week : 3 **Credit : 3**

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

MCA 4 E 05 B ARTIFICIAL INTELLIGENCE

Hours/ week : 3 **Credit : 3**

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.

Unit5

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, 5th Edn, pearson.

Reference Books:

1. E. Rich, K. Knight, S B Nair, Artificial intelligence, 3rd Edn, McGraw Hill.
2. S. Russel and p. Norvig, Artificial intelligence – A Modern Approach, 3rd Edn, pearson
3. D W Patterson, introduction to Artificial Intelligence and Expert Systems, PHI, 1990

MCA 6 E 02 B DIGITAL IMAGE PROCESSING

Contact Hours/ week : 3 **Credit : 3**

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

MCA 6 E 03 B/E DATA MINING

Hours/ week : 3 **Credit : 3**

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.
6.

MCA 4 E 05 C OBJECT ORIENTED MODELING & DESIGN

Hours/ week : 3 **Credit : 3**

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 synchronization, 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.

Unit4

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.

Unit5

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.

Reference books

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

MCA 5 E 04 C SOFTWARE ARCHITECTURE

Hours/ week : 3 **Credit : 3**

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 - CASE study of Architectures Designing, Describing, and Using Software Architecture - IS2000: The Advanced Imaging Solution - 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.

Unit5

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

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

MCA 5 E 05 C SOFTWARE PROJECT MANAGEMENT

Hours/ week : 3 **Credit : 3**

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, DhanpatRai& Co
2. Bob Hughes, Mike Cotterell, Software Project Management, Rajib Mall : Tata McGraw Hill

MCA 6 E 01 C SOFTWARE TESTING AND QUALITY ASSURANCE

Hours/ week : 3 **Credit : 3**

UNIT 1 :TESTIING ENVIRONMENT AND TEST PROCESSES

World-Class Software Testing Model – Building a Software Testing Environment - Overview of Software Testing Process – Organizing for Testing – Developing the Test Plan – Verification Testing – Analyzing and Reporting Test Results – Acceptance Testing – Operational Testing – Post Implementation Analysis

UNIT 2: TESTING TECHNIQUES AND LEVELS OFTESTING

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design – Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing – Compatibility testing – Levels of Testing - Unit Testing - Integration Testing - Defect Bash Elimination. System Testing - Usability and Accessibility Testing – Configuration Testing - Compatibility Testing - Case study for White box testing and Black box testing techniques.

UNIT 3: INCORPORATING SPECIALIZED TESTING RESPONSIBILITIES

Testing Client/Server Systems – Rapid Application Development Testing – Testing in a Multiplatform Environment – Testing Software System Security - Testing Object-Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Testing a Data Warehouse - Case Study for Web Application Testing.

UNIT 4 : TEST AUTOMATION

Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

UNIT 5 : SOFTWARE TESTING AND QUALITY METRICS

Testing Software System Security - Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics. Test the software by applying testing techniques to deliver a product free from bugs

REFERENCES:

1. William Perry, "Effective Methods of Software Testing", Third Edition, Wiley Publishing 2007
2. SrinivasanDesikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2007.
3. NareshChauhan , "Software Testing Principles and Practices " Oxford University Press , New Delhi , 2010.
4. Dale H. Besterfiled et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
5. Stephen Kan, "Metrics and Models in Software Quality", Addison – Wesley, Second Edition, 2004.
6. LleneBurnstein, " Practical Software Testing", Springer International Edition, Chennai, 2003
7. RenuRajani,Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill,2004.
8. Edward Kit, " Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
9. Boris Beizer, " Software Testing Techniques" – 2 nd Edition, Van Nostrand Reinhold, New York, 1990
10. Adithya P. Mathur, " Foundations of Software Testing – Fundamentals algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

MCA 6 E 02 C/D/E CLOUD COMPUTING

Hours/ week : 3 **Credit : 3**

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.ProgrammingTechnologies : AJAX, JSON, Web Services (RPC, REST)- MVC
Design Patterns for Cloud Application Development.

Reference Books:

1. R. BUYYA, C. VECCHIOLA, S T. SELVI, Matering Cloud Computing, McGraw Hill (India) Pvt Ltd., 2013
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
6. Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill Edition, Fourth Reprint, 2010

MCA 6 E 03 C OPERATIONS RESEARCH

Hours/ week : 3 **Credit : 3**

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

MCA 4 E 05 D MOBILE COMPUTING

Hours/ week : 3 **Credit : 3**

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

MCA 5 E 05 D INFORMATION SECURITY

Hours/ week : 3 **Credit : 3**

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 - RSAalgorithm.

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.

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

Unit 5

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. BuceSchneier., 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

MCA 6 E 01 D VISUAL CRYPTOGRAPHY

Hours/ week : 3 **Credit : 3**

UNIT 1

Digital image Processing: Fundamentals:- Digital Image Representation-coordinate conversions, images as matrices, Image Types- intensity images, binary images, RGB images; Color Image Processing:-, Colour Image Representation- RGB model, CMY model, CMYK model, HSI model. Image file formats.

UNIT 2

Principles of steganography and digital watermarking and their applications.

Secret Sharing- Introduction,History of secret sharing, principle of secret splitting, phases of secret sharing, Access Structures, Threshold Schemes, Shamir's Scheme, Applications.

UNIT 3

Visual Cryptography- Introduction- History of Visual Cryptography, Construction of Visual Cryptography Schemes, basis matrices, Construction of 2-out-of-2 Visual Cryptography Schemes, Construction of 2-out-of-2 Visual Cryptography Schemes with Square Pixel Expansion, Construction of Visual Cryptography Schemes with Consistent Image Size.

UNIT 4

Visual Cryptography Schemes- Construction of 2-out-of-n Visual Cryptography Schemes, Basis Matrices for 2-out-of-n Visual Cryptography Schemes, Construction of n-out-of-n Visual

Cryptography Schemes, Basis Matrices for n-out-of-n Visual Cryptography Schemes, Construction of k-out-of-n Visual Cryptography Schemes, Basis Matrices for k-out-of-n Visual Cryptography Schemes.

UNIT 5

Colour Visual Cryptography – subpixel layout of colour visual cryptography, Variations of colour visual cryptography Schemes- Constructing a '2 out of 2' colour Visual Cryptography Schemes, Constructing a '2 out of n' colour Visual Cryptography Schemes, Applications of Visual Cryptography.

References

1. BorkoFurht, EdinMuharemagic and Daniel Socek, Multimedia Encryption and Watermarking, Springer.
2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education.
3. Jen- Shyang Pan, Hsiang- Cheh Huang and Lakhi C. Jain,Intelligent Watermarking Techniques, World Scientific.
4. Josef Pieprzyk, Thomas hardjino and Jennifer Sebberry,Fundamentals of computer security, Springer International Edition 2008.

MCA 6 E 03 D CYBER FORENSICS

Hours/ week : 3 **Credit : 3**

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 scenes, 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 forensics 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.

U**NIT5**

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.

MCA 4 E 05 E HIGH PERFORMANCE COMPUTING

Hours/ week : 3 **Credit : 3**

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. AnanthGrama, 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.

MCA 5 E 05 E DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS

Hours/ Week: 3 **Credit : 3**

UNIT 1

INTRODUCTION Introduction to Parallel Algorithms – Models of Parallel Computation – Sorting on an EREW-SIMD PRAM Computer – Relation between PRAM Models – SIMD Algorithms – MIMD Algorithms – Selection – Desirable Properties for Parallel Algorithms - Parallel Algorithm for Selection – Analysis of Parallel Algorithms.

UNIT 2

SORTING AND SEARCHING 9 Merging on the EREW and CREW Models - Fast Merging on EREW - Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW Models – Searching a Sorted Sequence – Searching a Random Sequence.

UNIT 3

ALGEBRAIC PROBLEMS

Generating Permutations and Combinations in Parallel – Matrix Transpositions – Matrix by Matrix Multiplications – Matrix by Vector multiplication.

UNIT 4

GRAPH THEORY AND COMPUTATIONAL GEOMETRY PROBLEMS

Connectivity Matrix – Connected Components – All Pairs Shortest Paths – Minimum Spanning Trees – Point Inclusion – Intersection, Proximity and Construction Problems - Sequential Tree Traversal - Basic Design Principles – Algorithm – Analysis.

UNIT 5

DECISION AND OPTIMIZATION PROBLEMS

Computing Prefix Sums – Applications - Job Sequencing with Deadlines – Knapsack ProblemThe Bit Complexity of Parallel Computations

REFERENCES:

1. Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall, New Jersey, 1989.
2. Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, 2003.
3. Justin R. Smith, "The Design and Analysis of Parallel Algorithms", Oxford University Press, USA , 1993. 4. Joseph JaJa, "Introduction to Parallel Algorithms", Addison-Wesley, 1992.

MCA 6 E 01 E BIG DATA ANALYTICS

Hours/ Week: 3 **Credit : 3**

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 – HadoopConfiguration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoopbenchmarks- Hadoopin 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, 3rdEdn, O'reily Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding BigData: Analytics for Enterprise ClassHadoop and Streaming Data, McGrawHill Pub, 2012
4. AnandRajaraman& 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, 3rdEdn, Morgan Kauffman, 2012.
9. Da Ruan, Guoquing Chen, Etienne E.Kere, Geert Wets, Intelligent Data Mining, Springer,2007