



RCSS

RAJAGIRI COLLEGE OF
SOCIAL SCIENCES
(AUTONOMOUS)

Scheme and Syllabus

MASTER OF COMPUTER APPLICATIONS

2016-2019

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Preamble

Programme Educational Objective

- Graduates of the program will be computer professionals of probity, positive attitude and scientific temper
- Graduates of the program will have sound theoretical knowledge and skill for software development and implementation
- Graduates of the program will possess good communication, technical and innovative skills
- Graduates of the program will have a sense of social awareness

Graduate Attributes for the course is defined as follows:

- Conceptual clarity and Computational knowledge
- Analytical and Logical Reasoning skills
- Creativity in design and development of software solutions
- Communication skills
- Ability to work independently and in teams
- Innovation and Entrepreneurship
- Professional ethics and Social sensitivity

The curriculum of Master of Computer Applications (MCA) – Rajagiri College of Social Sciences (Autonomous) conforms to the duration, structure and number of credits of the MCA curriculum of the M.G University. Based on recommendations of the Board of Studies (Computer Science) and the Academic Council, the following changes have been incorporated to the existing curriculum (2011 onwards) of the parent university.

1. The changes that have been incorporated in Semester 1:
 - a. Probability and Statistics has been introduced in semester 1 instead of Semester 2.
 - b. Database Management System has been moved to semester 1 instead of semester 3.
 - c. Computer Organization, Digital Systems and Microprocessor has been merged into a single paper “Computer Organization and Architecture” covering all the essentials of the three subjects.
 - d. Principles of Management has been redrafted with changes to the existing syllabus and renamed as Essentials of Management and Organizational Behaviour.

Semester 2:

- a. Operations Research has been introduced in semester 2 instead of Semester 4.
- b. Software Engineering has been moved to semester 2 instead of semester 3.
- c. The existing "Data Structures" has been redrafted into two single papers "Data Structures" and "Analysis of Algorithms". The redrafted "Data Structures" is retained in the second semester. Modifications have been made to Operating Systems by including Linux as a case study of operating system.

Semester 3:

- a. Design and analysis of algorithm has been included as a separate subject.
- b. The subjects Computer Networks and Data Communication has been combined together to form a single subject as "Data Communication and Computer Networks".
- c. Computer Graphics and Multimedia has been moved from semester 5 to semester 3.

Semester 4:

- a. Specialization tracks are introduced in semester 4.
- b. Introduced a new paper 'Business Processes and Information Systems'.
- c. Introduced .NET programming in 'Internet Programming Using Framework'.
- d. Introduced the Lab for Framework used for Internet Programming.
- e. Mini Project Lab is introduced in Semester 4. Earlier the paper was in semester 5.

Semester 5:

- a. Specialization tracks are continued in semester 5, where students have to choose papers from the same pool chosen in Semester 4.
- b. Introduced a new paper 'Parallel Programming'.
- c. Redrafted the syllabus for Linux Administration.
- d. Introduced a new lab 'Specialization Lab' for the pool chosen.

Specialization Tracks

Two pools of 4 specialization tracks are incorporated in the syllabi, in which 2 subjects from pool 1 will be offered in semester 4 and two subjects from pool 2 will be offered in semester 5. The course is designed to make a graduate, expert in any of the following specialization tracks. The details are given in the scheme.

REGULATIONS and SCHEME

Eligibility Criteria

Recognized Bachelors degree of minimum three years duration with Mathematics at 10+2 level or at graduate level with a minimum of 50% in their degree examinations. Candidates who pass B Com degree with Business Mathematics or Business Statistics is also eligible for admission. For SEBC and Physically challenged candidates, the minimum aggregate marks required is 45% and SC/ST, a pass in the degree examination is sufficient.

The un-availed seat reserved for SC/ST shall be re-notified twice. In their absence, those seats may be filled up from candidates belonging to OEC and in their absence from candidates belonging to SEBC and seats still remaining un-availed will go to the open merit quota

Duration of the Course:

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

Medium of Instruction

The medium of instruction, examination, seminar and project report shall be in **English**.

Examination System

For each theory course, two Continuous Assessment Examinations (CAE) and one End Semester Examination (ESE) are conducted. For each practical course only one CAE and ESE are conducted. Other components like Seminar, Project, Communication and Viva etc. are conducted as per the course guidelines.

The End Semester Examination (ESE) shall be conducted for theory / practical papers (courses) as per the requirement of the programme. Evaluation of project / dissertation and viva voce examination also shall be conducted if the same are included in the syllabi. The guidelines set by the Academic Council shall be followed for the conduct and evaluation of such examinations.

Continuous Internal Assessment (CIA) of a course:

Continuous Internal Assessment is based on the performance of the student throughout the semester.

Components of CIA-Theory

Sl No	Component		Marks
1	Continuous Assessment Examination (CAE)	CAE 1	7.5 Marks
2		CAE 2	7.5 Marks
3	Assignment/Project/Term paper (Individual)/Class Participation/Presentation/Quizzes/Seminars/Case Studies/ Group Project work/VIVA voce etc... (Any two is compulsory based on GA mentioned in course plan)		7.5 Marks
4	Attendance		2.5 Marks
Total			25 Marks

Components of CIA-Practical's

The practical paper is evaluated with 25 marks as internals and 75 marks for the end semester examinations. The internal evaluation is based on the participant's lab performance which includes lab record, timely completion of programs, class tests and continuous assessment examination. The external evaluation is based on program coding, output, fair record and viva voce of the participant.

Internal Marks

- Lab Performance
 Rough Record, Lab Assignments,
 Projects/Surprise Tests : 7.5 marks
 - Continuous Assessment Examination : 15 marks
 - Attendance : 2.5 marks
- Total : 25 marks**

Continuous Assessment Examination-Practical's (Duration: 2hrs)

- Parameters For Continuous Assessment Examination (Max marks: 50)
 - Algorithm/Program/Flowchart/Pseudocode : 10 mark
 - Coding/Debugging/Implementation : 20 mark
 - Formatted Output : 10 mark
 - Viva Voce : 10 mark

Total : 100%

External Marks

End Semester Examination-Practical's (Duration: 3 Hrs) (Max marks: 75)

- Fair record : 10 marks
- Viva-voce : 10 marks
- Evaluation Criteria For Program1 :20 marks
 - 1. Algorithm : 8 mark
 - 2. Writing Program : 8 mark
 - 3. Formatted Output : 4 mark
- Evaluation Criteria For Program 2 : 35 mark
 - 1. Algorithm : 15 mark
 - 2. Writing Program : 15 mark
 - 3. Formatted Output : 5 mark

Total 75 marks

Mini Project & Main Project

Components of CIA

- Presentation : 50%
- Report : 25%
- Guide : 25%
- Guide grade the project based on
 - Communication : 20%
 - Analysis : 40%
 - Demonstration : 40%

End Semester Examination Evaluation Criteria

Mini Project And Main Project

- Record : 20%
- Viva : 30%
- Demonstration : 50%

Course Viva –Completely based on end semester examination -100%

Course viva to be conducted for a minimum of 5 subjects which they have learnt in their course.

End-Semester Examination (ESE)

End-Semester Examination (ESE): this will be a formal exam at the end of the semester. ESE will be of 3 hours duration and conducted out of 75 marks.

Eligibility to appear for ESE:

Permission for admission to ESE is granted only if:

- He/she has secured minimum 50% of CIA of each course to appear for the ESE of the same.
- A student has to have at least 75% of attendance for each subject at the end of the semester. His progress and conduct have been satisfactory. The sessional marks allotted for attendance shall be awarded in direct proportion to the percentage of attendance secured by the candidate in the subject. However, full sessional marks for attendance shall be awarded to those who are securing 80% of the attendance and above
- Condonation

However, a candidate can repeat the programme or have condonation of attendance or temporary break of study only once during the entire programme of study. Condonation of shortage of attendance will be granted for 10 days in a semester subject to a maximum once for the entire programme of study. Condonation will be granted only on medical grounds and on recommendation by the Head of Department (HOD). The cause of absence on medical ground shall be reported to the HOD without any delay. If a student represents his/her institution, State/National in sports/NCC/NSS/cultural or any other officially sponsored activities such as College Union/University Union activities he/she shall be eligible to claim attendance for the actual number of days participated subject to a maximum of 10 days in a semester ,based on the specific recommendation of the HOD. A Candidate who is not eligible for condonation of shortage of attendance shall repeat the programme in full including the CIA mark in the next immediate chance. The sessional marks obtained during repetition alone will be taken in such cases.

- Pass in CIA of individual course is a prerequisite for appearing for the corresponding ESE of the Course.
- Every candidate shall register for all the courses at the end of each semester. A candidate who does not register for exam will not be permitted to attend the end semester examination and shall not be permitted to attend the next semester.

Eligibility for Promotion to Next Year

Students will be allowed to go till the last semester of the studies of corresponding programme and in case of any back log papers even after last semester, the policy for supplementary chances of examination will be applicable for them.

Normalization of Sessional Marks

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

Normalization Method

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

Illustration

Internal Maximum marks - 25

Pass minimum - 12.5

External Maximum marks - 75

Pass minimum - 30

Overall Maximum marks - 100

Pass minimum - 50

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

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

Pass Requirements for MCA Programme

A candidate shall be declared to have passed in any subject in full in any semester if he/she secures not less than 50% marks in sessional, not less than 40% marks in the End Semester Examination including project and viva and not less than 50% of the overall aggregate marks for the subject ie., End Semester Examination marks and CIA of the subjects put together.

- A candidate who is absent for the end semester exam or secures 'F' grade or less than 40% in ESE in any subject will retain the already secured sessional marks for subsequent supplementary appearance in the examination of that subject.
- Students who have secured not less than 50% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the degree examination in Second Class.
- Students who have secured not less than 60% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the degree examination in First Class.
- Students who have secured not less than 75% marks in aggregate for all the semesters within the prescribed period of the programme shall be declared to have passed the examination in First Class with distinction.
- Photocopies of the answer scripts of the ESE shall be made available to the students for scrutiny on request Revaluation/ scrutiny shall be done as per the prevailing rules after collecting the prescribed fee.

Non-Credit Courses

All the Semesters except the final semester has a non-credit course termed as Add-on course (AOC) as part of the curriculum. The students are required to score a minimum of 50% for each non-credit course for the successful completion of the MCA programme.

Grievance Redressal Committee

There shall be a Grievance Redressal Committee in each Department comprising of two teachers & HOD as Chairman .There shall be a College level Grievance Redressal

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Committee, comprising of two senior teachers, two staff council members and the Principal as the chairman.

SCHEME

I Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA101	Probability and Statistics	4	-	3	25	75	100
MCA102	Computer Organization and Architecture	4	-	3	25	75	100
MCA103	Problem Solving with Structured Programming in C	4	-	3	25	75	100
MCA104	DBMS	4	-	3	25	75	100
MCA105	Essentials of Management and Organizational Behaviour	4	-	3	25	75	100
MCA106	C Lab	-	4	3	25	75	100
MCA107	DBMS Lab	-	4	3	25	75	100
AOC1	System Administration		2				
	Total	20	10				700

II Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA201	Operations Research	4	-	3	25	75	100
MCA202	Operating Systems	4	-	3	25	75	100
MCA203	C++ and Object Oriented	4	-	3	25	75	100

	Programming Paradigms						
MCA204	Software Engineering	4	-	3	25	75	100
MCA205	Data Structures	4	-	3	25	75	100
MCA206	CPP Lab	-	4	3	25	75	100
MCA207	DS Lab	-	4	3	25	75	100
AOC2	Communicative English	2					
	Total	20	8				700

III Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA301	Design and Analysis of Algorithms	4	-	3	25	75	100
MCA302	Data Communications and Computer Networks	4	-	3	25	75	100
MCA303	System Software and Compiler Design	4	-	3	25	75	100
MCA304	Java Programming	4	-	3	25	75	100
MCA305	Computer Graphics and Multimedia	4	-	3	25	75	100
MCA306	Java Lab	-	4	3	25	75	100
MCA307	Computer Graphics Lab	-	4	3	25	75	100
AOC3	Yoga		2				
	Total	20	10				700

IV Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA401	Internet Programming using Framework	4	-	3	25	75	100
MCA402	Business Processes and Information Systems	4	-	3	25	75	100
MCA403	Object Oriented Modelling and design with UML	4	-	3	25	75	100
MCA404	MCA 4xx	4	-	3	25	75	100
MCA405	MCA 4xx	4	-	3	25	75	100
MCA406	Internet Programming using Framework lab	-	4	3	25	75	100
MCA407	Mini Project (Socially Relevant Using Java- RDBMS)	-	4	3	25	75	100
AOC4	Technical Report Writing	2					
	Total	22	8				700

V Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA501	Data Mining	4	-	3	25	75	100
MCA502	Linux Administration, Management and Networking	4	-	3	25	75	100

MCA503	Parallel Programming	4	-	3	25	75	100
MCA504	MCA 5xx	4	-	3	25	75	100
MCA505	MCA 5xx	4	-	3	25	75	100
MCA506	Linux Lab	-	4	3	25	75	100
MCA507	Specialization Lab	-	4	3	25	75	100
AOC5	Course in Latest technology*	-	4	-	-		
	Total	20	12				700

* Will be based on the industrial demand.

VI Semester

Course No:	Subject	No. of hours per week		Duration of exam in hrs	CIA Marks Max	ESE Exam Marks	Total Mark
		Lect	Lab				
MCA601	Project	-	28	-	200	200	400
MCA602	Viva Voce	-		-	-	100	100
	Total		28	-	-		500

Specialization Tracks

The course is designed to make graduate expert in any of the following specialization tracks.

- 1: Knowledge Engineering
- 2: Programming Series
- 3: Advanced Software Engineering
- 4: Information Security

A student can choose the specialization track on or before the end of 2nd Semester. Two pools of subjects are given for each track. Given the Specialization track, a student can choose any two subjects from pool 1 in semester 4 and any two subjects from pool 2 in semester 5 in consensus with the faculty council. A batch can pick a maximum of two tracks based on the majority selection of its students.

1: Knowledge Engineering

Pool 1

1. Data Warehousing (Subject Code: 411)
2. Digital Image Processing (Subject Code: 412)
3. Soft Computing (Subject Code: 413)

Pool 2

- Big Data Analytics (Subject Code: 511)
- Information Retrieval Analytics (Subject Code: 512)
- Social Media Mining (Subject Code: 513)

2: Programming Series

Pool1

- J2EE (Subject Code: 421)
- Open Source Lab PHP (Subject Code: 422)
- Android (Subject Code: 423)

Pool2

- Struts and Hibernate (Subject Code: 521)
- Open Source Lab – Python (Subject Code: 522)
- Developing Mobile Applications with iOS Platform (Subject Code: 523)

3: Advanced Software Engineering

Pool1

- Software Requirements Engineering (Subject Code: 431)
- Software Design and architecture (Subject Code: 432)
- Software Testing (Subject Code: 433)

Pool2

- Software Project Management (Subject Code: 531)
- Software Risk Management (Subject Code: 532)
- User Interface Design (Subject Code: 533)

4: Information Security

Pool 1

- Mathematical Foundations of Information Security (Subject Code: 441)
- Web and Database Security (Subject Code: 442)
- Emerging Security Technologies (Subject Code: 443)

Pool 2

- Network Security Architecture (Subject Code: 541)
- Wireless Security (Subject Code: 542)
- Cyber Forensics (Subject Code: 543)

SEMESTER 1

MCA 101 PROBABILITY AND STATISTICS

Module 1:-Basic Statistics

Measures of central tendency: - mean, median, mode; Measures of dispersion: Range, Mean deviation, Quartile deviation and Standard deviation; Moments, Skewness and Kurtosis, Linear correlation, Karl Pearson's coefficient of Correlation, Rank correlation and linear regression.

Module 2:- Probability Theory

Sample space, Events, Different approaches to probability, Addition and multiplication theorems on probability, Independent events, Conditional probability, Bayes Theorem

Module 3:- Random variables and Distribution

Random variables, Probability density functions and distribution functions, Marginal density functions, Joint density functions, mathematical expectations, moments and moment generating functions. Discrete probability distributions - Binomial, Poisson distribution, Continuous probability distributions- uniform distribution and normal distribution.

Module 4:- Sampling and Estimation

Theory of Sampling: - Population and sample, Types of sampling Theory of Estimation: - Introduction, point estimation, methods of point estimation- Maximum Likelihood estimation and method of moments, Central Limit Theorem (Statement only).

Module 5:-Testing of hypothesis

Null and alternative hypothesis, types of errors, level of significance, critical region, Large sample tests - Testing of hypothesis concerning mean of a population and equality of means of two populations Small sample tests - t Test- for single mean, difference of means. Paired t-test, Chi-square test (Concept of test statistic χ^2/σ^2), F test - test for equality of two population variances.

References

- Fundamentals of statistics: S.C.Gupta, 6th Revised and enlarged edition April 2004, Himalaya Publications.
- Introduction to Probability and Statistics, Medenhall, Thomson Learning , 12 Edn.
- Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.

- Introduction to Mathematical Statistics -Robert V. Hogg &Allen T. Craig. Pearson education.

MCA 102 COMPUTER ORGANIZATION AND ARCHITECTURE

Module1

Basic components of a computer, Number systems - Efficiency of number system, Decimal, Binary, Octal, Hexadecimal conversion from one to another- Binary addition, subtraction, multiplication and division, representation of signed numbers, addition and subtraction using 2's complement and 1's complement. Floating point representation.

Binary codes - BCD code, Alphanumeric code

Module II

Logic Gates - Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams.

Boolean Algebra - Basic laws and theorems, Boolean functions, truth table, minimization of boolean function using K map method, Realization using logic gates and universal gates.

Combinational circuits - Half adder, Full Adder, Parallel binary adder, fast adder, Subtractor, Decoders, Encoders, Multiplexers, Demultiplexers.

Sequential circuits - Flip Flops – RS, JK, T and D Flip Flops, Edge triggered Flip Flops, introduction to registers.

Module III

Memory Locations and addresses, Memory Operations, Instructions and Instruction sequencing, Addressing modes, Basic Input Output Operations. The Main Memory- Memory Hierarchy – Main memory - RAM-ROM – Cache Memory – Performance Considerations -Virtual Memory- Memory Management Requirements.

Module IV

The Processing Unit : Basic Concepts - Instruction execution cycle - sequencing of control signals - hardwired control - microprogrammed control - control signals - microinstructions- microprogram sequencing. Introduction to pipelining.

Module V

Input / Output Organization: Accessing I/O devices - Interrupts: Interrupt processing – hardware interrupts –programmable interrupt controller – Vectored Interrupts - Interrupt nesting - Daisy chaining - Direct memory access (DMA): DMA operations & DMA Controller

References

- Digital Fundamentals - Floyd, Pearson Education, 2004.

- Computer Organization, V C Hamacher, Mc-Graw Hill International Edition, Fifth Edition.
- Computer Architecture and Design: The Hardware/Software Interface - John Hennessy and David Patterson, Morgan Kaufmann Publishers Inc, Third Edition
- Computer Organization and Architecture: Designing for performance - William Stallings - Eighth Edition.

MCA103 PROBLEM SOLVING WITH STRUCTURED PROGRAMMING IN C

Module I: introduction

Introduction to structured programming concept, algorithm, flowchart, program. Steps in building a C program. Introduction to C Language: The C character set, identifiers and keywords, data types, constants, variables and arrays, declarations, expressions, statements, Lvalues and Rvalues , type conversion, symbolic constants.

Module II : Operators and Control Statements

Operators and expressions: Arithmetic operators, unary operator, relational and logical operator, assignment operators, the conditional operator, type conversion in expressions. Data input and output: scanf, printf, get, put, puts, gets functions. Control statement: Branching: if else statement, Looping, nested control structure, switch statement, break statement, continue statement, comma operator, goto statement.

Module III: Functions and Arrays

Functions: Overview, function prototypes, passing arguments to a function, recursion. Command line arguments,
Arrays: Defining an array, passing array to functions, multidimensional arrays, strings: one dimensional character array, array of strings.

Module IV : Pointers

Pointers: Fundamentals, void pointer, null pointer, passing pointers to a function, pointers and one dimensional arrays, dynamic memory allocation, operation on pointers, pointers and multidimensional arrays, array of pointers, pointer to an array, pointers and strings, structure pointer, pointers to function, passing functions to other functions.

Structures, unions & enumerations: Defining a structure, processing a structure, user defined data types, bit fields, structure and pointers, passing structure to function, self-referential structures, enumeration and union.

Module V : Files

Data files: Why files, opening and closing a data file, reading and writing a data file, processing a data file, unformatted data file, concept of binary file.

Program structure: Storage classes, automatic variables, external variables, static variables, Register variables. Macros.

References

- The c programming language – Brian W Kernighan & Dennis Ritchie IInd edition
- Eastern Economy Edition, Prentice Hall 2001
- Programming with C – Byron S Gottfried– Schaum’s outlines 2nd Edition,2010
- Computer Science: A Structured Programming Approach Using C, Forouzan,
- 3rd Cengage Learning 2007
- C – How to Program, Deitel&Deitel, Pearson Education Asia, 6th Edition,2009
- Programming in C –PradipDey, Manas Ghosh – Oxford Higher Education ,2007
- Ansi C programming Bronson, Cengage learning, C2009
- Understanding pointers in C- YashavantKanetkar – BPB publication , 2009
- Let us C - YashavantKanetkar – BPB publication C. 1997
- C by discovery – I s Foster – Pearson C 2005
- Working with C - YashavantKanetkar – BPB publication,2008
- Instant C program – Ivor Horton – Wrox, 1995
- The art of programming computer science with ‘C’ – Steven c Lawlor – Wess , Cengage C2006

MCA 104 DATABASE MANAGEMENT SYSTEM

Module I -Introduction To Database Systems and E-R Model

Overview, A Historical Perspective, Files System versus DBMS, Advantages of DBMS, Describing and storing data in a DBMS ,Transaction management, Structure of a DBMS, People who work with Databases, Overview of Database Design. Entities, Attributes and Entity Sets, Relationships and Relationship sets, Additional Features of E-R Model: Key Constraints. Conceptual Design with the E-R Model, Overview of Unified Modeling Languages

Module II -Relational Model and Query Languages

Introduction to the Relational Model. Integrity Constraints over Relations : Primary Key, Foreign Key and General Constraints. E-R Model to Relational Model: Entity Sets to Tables, Relationship Sets to Tables, Translating, Relationship Sets with Key Constraints. Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets, Translating Class Hierarchies. Translating E-R Diagrams with Aggregation, Introduction to Query Languages, Relational Algebra: Selection and Projection Operations. Set Operations, Renaming, Joins, Division

Module III- Relational Database Design

Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Normal Forms: First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form, Fourth Normal Form, Fifth Normal Form

Module IV- Structured Query Language

Overview of SQL, Basic Queries in SQL, Union, Intersect and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Views in SQL, Embedded SQL and Cursors

Module V -Transaction Management, Concurrency Control and Distributed System

The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions: Serialisability, Anomalies Due to Interleaved Execution. Schedules Involving Aborted Transactions, Lock-Based Concurrency Control: 2 PL – Basic & Strict, Dead Locks, Introduction to Crash Recovery, Concurrency Control: 2 PL, Serialisability, and Recover-ability,; Introduction to Locking Management: Dealing with Deadlock .Introduction to ARIES, Introduction to Distributed Databases: Advantages & Disadvantages, Transaction Types – Local & Global Transactions, Distributed DBMS Architectures, Design of Distributed Databases: Replication, Fragmentation

Reference Books :

- Database Management Systems – Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003
- Database Systems: Design ,Implementaion and Management, Peter Rob, Thomson Learning, 7Edn.
- Concept of Database Management, Pratt, Thomson Learning, 5Edn.
- Database System Concepts – Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006
- The Complete Reference SQL – James R Groff and Paul N Weinberg, Second Edition, Tata McGraw Hill, 2003

MCA 105 ESSENTIALS OF MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

Module I- Basic concepts, Evolution and growth of management

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.

Module II -Planning, Organising, Staffing, Directing

Planning – Meaning, nature, structure, steps, effective planning, MBO, SWOT Analysis. Organizing – meaning, process, structure, formal and informal, types of organization, departmentation, delegation of authority. Staffing – meaning, nature, staffing process, recruitment & selection. Directing, supervision.

Module III –Motivation, controlling, Coordination

Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y. Leadership, Controlling-concepts, steps, objectives, features of a good control system. Coordination- Meaning, nature, significance, types of coordination, Techniques of effective coordination.

Module IV – Marketing Management

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. Global marketing.

Module V –Organizational Behavior

Organizational behavior – Key elements, scope, models of OB, Individual behavior- personality, Perception, Attitudes values and job satisfaction, Group behavior- team building- Types, process, roles. Job frustration, Job stress, Communication.

References

- Principles & Practice of Management –T.N.Chabra
- Principles of Management, R N Gupta, S.Chand& Company Ltd.
- Organizational Behavior, S.S Khanka, S.Chand& Company Ltd
- Principles of Management, L M Prasad, Sultan Chand Publications

MCA 106 C PROGRAMMING LAB

Section A

- Familiarization of Editor (Turbo C), compiling, executing, debugging, watch, break point
- Implementation of the various Data Types in C, values, ranges, type conversion
- Implementation of various Storage Types.
- Demonstration of for loop.
- Demonstration of do...while loop.
- Demonstration of while loop.
- Demonstration of nested if (Hint: Use logical operators).

- Demonstration of switch... case structure.
- Implementation of arrays.
- Implementation of multidimensional arrays
- Implementation of functions
- Demonstration of various string operations
- Demonstration of pointer operations.
- Demonstration of recursion
- Demonstration of Debugging a C program.

Section B

- Implementation of structures
- Implementation of Union, enumeration.
- Implementation of pointers to structures and unions.
- Demonstration of dynamic allocation of memory
- Demonstration of bitwise operations.
- Demonstration of macro processing.
- Demonstration of various file operations.
- Implementation of character counting, line counting and word counting for a file.
- Program to find the lengthiest line in a text file.

MCA 107 DBMS Lab

Programs

1. Oracle Installation.
2. Table Design- Using foreign key and Normalization
3. Practice SQL Data Definition Language (DDL) commands
 - a. Table creation and alteration (include integrity constraints such as primary key, Referential integrity constraints, check, unique and null constraints both column and table level.
 - b. Other database objects such as view, index, cluster, sequence, synonym etc.
4. Practice SQL Data Manipulation Language (DML) commands
 - a. Row insertion, deletion and updating
 - b. Retrieval of data
 - i. Simple select query
 - ii. Select with where options (include all relational and logical operators)
 - c. Functions: Numeric, Date, Character, Conversion and Group functions with having clause.

- d. Set operators
 - e. Sorting data
 - f. Sub query (returning single row, multiple rows, more than one column, correlated sub query)
 - g. Joining tables(single join, self join, outer join)
5. Practice Transaction Control Language (TCL) commands (Grant, revoke, commit and save point options)
 6. Usage of triggers, functions and procedures
 7. Development of sample applications using Oracle as Back End Sample applications may include
 - Payroll Information
 - Student Information System
 - Bank Transaction
 - Library Information System etc.

(Each question will more than one example of relevance).

AOC 1 SYSTEMS ADMINISTRATION

- Lab Practical: 25 Hours
- Assessment and Evaluation: 5 Hours

Lab Cycle

- Identification of PC Components (2 Hours)
- Assembling PC (2 Hours)
- Installation of Operating Systems, Operations and Configuration (At least 4 OS should be installed and configured) (6 Hours)
- Troubleshooting - Hardware and Operating System(3 Hours)
- Installation of software Packages (At least 5 packages) (2 Hours)
- Networking and Administration(10 Hours)
- Basic Terminologies
- Network Topologies and media types
- Cable crimping
- TCP/IP Addressing Scheme
- Configuring network devices
- Trouble shooting Network connectivity and Routing Problems

Reference

- The Complete Reference - PC Hardware - Craig Zacker& John rourke, Edition 2001 Tata McGraw Hill

SEMESTER 2

MCA 201 OPERATIONS RESEARCH

Module I

Linear programming problems - Mathematical formulation, graphical method of solution, simplex method

Module II

Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.

Module III

Game theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of $2 \times n$ and $m \times 2$ games, dominance property. CPM & PERT- project scheduling, critical path calculations, Crashing.

Module IV

Queueing theory -basic structure of queueing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.

Module V

Simulation: simulation concepts, simulation of a queueing system using event list,pseudo random numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.

References

- Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7thed.
- Ravindran A, Philips D.T &Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
- Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
- Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
- Joseph.G.Ecker& Michael KupperSchimd, Introduction to operations Research, John Wiley & Sons, 1988.
- Hillier.F.S&Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.

- KantiSwarup, Gupta.P.K. & Man Mohan, operations Research, S.Chand& Sons.

MCA202 OPERATING SYSTEMS

Module 1: File Systems

File Systems, File concept, File support, Access methods, Allocation methods, Directory systems, File protection, free space management

Disk Management-Secondary-Storage Structure, Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability.

Module 2: Memory Management

Memory Management, Memory partitioning, Swapping, Paging, Segmentation, Virtual memory, Overlays, Demand paging, Performance of Demand paging, Page replacement algorithms, Allocation algorithms

Module 3: Process Management and Concurrency management

Process and Thread Management, Concept of process and threads, Process states, Process management, Context switching, Interaction between processes and OS, Multithreading, Concurrency Control, Concurrency and Race Conditions, Mutual exclusion requirements,

Module 4: Concurrency Management

Software and hardware solutions for mutual exclusion, Semaphores, Classical IPC problems and solutions Deadlock, Characterization, Avoidance and Prevention, Detection, Recovery

Module 5: Protection

Protection, Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights.

Case Study

Linux OS -File System, basic commands Processes, Access permissions, redirection, filters.

References:

- Silberschatz, Galvin, and Gagne, "Operating System Concepts", Eighth Edition, Wiley Publication, 2011.
- Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
- Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
- Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.
- Milan Milenkovic, "Operating Systems: Concept and Design", 2nd Edition, 2001.
- "Linux Command Line And Shell Scripting Bible (English) 2nd Edition", Wiley Publication.
- Richard Petersen, "Linux: The Complete Reference", Sixth Edition, 2007

MCA203 C++ AND OBJECT ORIENTED PROGRAMMING PARADIGMS

Module I

Introduction to Object-Oriented Programming: Evolution of programming methodologies. Procedural Approach Vs Object-Oriented Approach. Encapsulation and Abstraction, Message Passing, Inheritance, Reusability, Extensibility, Polymorphism, Overloading.

Objects and Classes: Access Specifiers. Memory Allocation for Objects, Friend Functions and Friend Classes, Static Data Members, Static Member Functions. this pointer. Comparison of class with structure. Inline functions.

Arrays of Objects; Objects as Function Arguments; Returning Objects; Constructing Two-Dimensional Arrays. String Manipulation using objects.

Module II

Constructors and Destructors: Purpose of Constructors and Destructors. Default Constructors, Constructors with & without parameters, Constructor Overloading, Copy Constructor. Invoking Constructors and Destructors.

Pointers in C++ : Pointer declaration and Access, Pointer to data member, pointer to member functions, pointer to object., memory management - new and delete, self referencing class.

Module III

Polymorphism: Overloading Concepts, Function Overloading: Operator Overloading: Defining Operator Function, Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading Comma, [], (), -, new, delete Operators, Overloading << and >> Operators for Objects. Type Conversions -Basic to Class, Class to Basic and One class to another class type.

Module IV

Inheritance: Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specified in Base class constructors and destructors in derived classes - Types of Inheritances. Protected visibility mode; Member Classes: Nesting of Classes.

Virtual Functions: Virtual Base Classes, virtual member function access, late binding, pure virtual function, abstract classes.

Module V

Console I/O operations: C++ streams and C++ stream classes - Predefined Objects, unformatted I/O operations, Formatted I/O operations - manipulators - User defined manipulators .

Disk I/O Operations: Stream Classes, classes for file stream operations, opening and closing a file, file modes, writing and reading objects, binary versus character files, tellg() and seekg(), seekp() and tellp(). Updating a File : Error Handling During File Operations.

Templates: Generic Functions- A generic swap function, Functions with more than one Generic Type, Overloading a Function Template. Generic Classes, Class template with more than one Generic Type

Exception Handling: Fundamentals of Exception Handling, Catching Class Types, Using Multiple catch statements, Catching All Exception, Restricting Exception, throw statement

References

- Object oriented Programming with c++. Balagursamy 4th edition or above
- Deitel&Deitel, *C++ How to program*, Pearson Education Asia, 7th Edition, 2010.
- Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn
- C++ Programming: Malik, Thomson Learning , 3 Edn
- K.R VenugopalRajkumar, *Mastering C++* , TMH.
- Gaddis Tony, *Starting Out with C++*, dreamtech Press,
- Sotter A Nicholas and Kleper J Scott, *Professional C++*, Wiley Publishing Inc.
- Schildt Herbert, *The Complete Reference C++*, Tata McGraw Hill, 4th Edition

MCA 204 SOFTWARE ENGINEERING

Module I

Software process

Software engineering definition, Software problems, important qualities of a software product, software engineering principles. Process Models - The Waterfall Model, Prototyping, incremental model, Spiral Model, V-Model. Agile development

Module II

Requirement Analysis, Design

Understanding Requirements, Requirements Modeling: Scenarios, Software requirements specification, SRS, Role & Skills of system Analyst, Design Concepts, Software Architecture, User Interface Design

Module III

Coding, Testing and Maintenance

Coding - programming principles and guidelines, Coding Standards, refactoring, verification, complexity metrics. Testing - Levels of testing, testing for conventional and object oriented applications, Maintenance - Need for maintenance, Management of maintenance, challenges of maintenance phase.

Module IV

Quality Management

Quality concepts, Software Metrics- LOC based, Function point Metric, Quality Metrics, Review techniques, software quality assurance, Software configuration management, Change Management

Module V

Software Project Management

Project Management Concepts, Estimation for Software Projects, Project Scheduling, Risk Management

References

- Software Engineering, a Practitioner's Approach- Roger S Pressman 7th Edition, Tata Mc-GrawHill Publishing Co. Ltd.
- Software Engineering – Ian Somerville 9th Edition, Pearson Education
- An Integrated Approach to Software Engineering- Pankaj Jalote 3rd edition, Narosa Publishing House
- Fundamentals of Software Engineering- Ghezzi, Jazayer's and Mandriolli 2nd Edition, PHI
- Software Engineering principles & Practice- Waman S Jawadekar 2nd Edition, Tata Mc-GrawHill Publishing Co. Ltd.
- Software Project Management: Pankaj Jalote, Pearson Education
- Software Project Management –A Unified Framework: Walker Royce, Pearson Education.
- Software Project Management –S A Kelkar .Prentice Hall India
- Information Technology and Project Management, Schwalbe, Thomson Learning 4Edn.

MCA205 DATA STRUCTURES

Module 1

Introduction: Data Structures, Data Types, Structure.

Arrays: Ordered lists –Representation of array, Merits and Demerits of array as data structure. Polynomial Representations, Polynomial addition, Polynomial Multiplication and sparse matrices

Stack: Definition and concepts, Operations on stacks. Application of stacks- Infix to postfix conversion, Evaluation of Arithmetic Expression.

Module II:

Queue: Representation of queue, circular queue and double ended queue. Priority queue: implementation by array using Heap Sort

Dynamic Memory Allocation Functions: malloc, calloc, realloc and free

Linked List: Operations – insertion, searching, removing, updating, sorting and reversing.

Polynomial: Representations, Addition, Multiplication using Linked List.

Module III:

Linear Data Structures: Linked stacks, Linked queues, Circular Linked List and Double Ended Queue, Doubly Linked List and Circular doubly linked list.

Non Linear Data Structures: Trees, Graphs.

Graph: Representation of Graph on Computer: Adjacency matrix and adjacency list, merits and demerits of graph representation

Searching: Linear Search, Binary Search

Module IV:

Trees: Basic terminology, binary trees, binary search tree

Binary search tree: Insertion, Deletion, searching and Traversal - in-order, pre-order and post-order.

Threaded Binary Tree: Operations

Balanced Trees: AVL Tree: properties, insertion, deletion and rotations

Module V:

Advanced Data Structures:Red black tree:properties.

B-Trees: Data Structure on secondary storage, Definition of B trees, Basic operations on B Trees - searching, creating an empty node, splitting a node in B Tree, Inserting a key in to B Tree and Deleting a Key from a B Tree

Definition and Structure: B+ Trees

Data Structure for Disjoint Sets: Disjoint set operation, linked list representation of disjoint sets, Disjoint-set forests

References

- Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest
- Fundamentals of data structures - Ellis Horowitz and SartajSahni (Galgotia , 1994)
- Fundamentals of computer algorithms- Ellis Horowitz, SartajSahni, SanguthevarRajeshkharan (Universities Press , 2007)
- Data Structure using C & C++ b, Tannenbaum and Augustine,prentice hall.
- Data Structures - a pseudocode approach with C -Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn., Cengage Learning C2005
- Data Structures and program design - R. L Kruse (Prentice Hall of India),C2001
- Data structures and Algorithms in C++, Adam Drozdek, Thomson Learning, 3 Edn, C2005
- Classic data structures - D Samanta (PHI), 2006
- Graph Theory by NarsinghDeo, Prentice-Hall of India publications, 2004.

MCA 206 C++ LAB

Lab Cycle A

- Program to Implement Classes and Objects.
- Program to Implement Constructors and Destructors with array of Objects.
- Program to Implement Passing and returning parameters as objects by reference.
- Program to demonstrate Function Overloading.
- Program to overload different operators - ++ & -- operators with post & pre forms; new, delete, [], () and arithmetic operators.
- Program to perform pointer sort operation.
- Program to demonstrate friend functions and friend classes.
- Program using objects for String manipulation functions.
- Program to implement different types of inheritances like Multiple, Multilevel and Hybrid.
- Program to demonstrate the use of Virtual Functions.

Lab Cycle B

- Program to demonstrate I/O streams and functions.
- Program to Overload << and >> operators as a member and as a non-member operator functions.
- Program to create a file to store some records and search for a particular record and display it.
- Program to perform all possible Type Conversions.
- Program to create function Templates, and overload the function Templates.
- Program to create a generic stack class and member functions to perform stack operations.
- Program to implement Exception Handling with minimum 5 exception classes including two built-in exceptions (Visual C++).

MCA207 DATA STRUCTURES LAB

Lab Cycle

- Represent Graph using array
- Stack using array
- Polynomial addition using array
- Polynomial multiplication using array
- Reverse a string using stack
- Implement Queue using array
- Circular Queue using array

- Double ended queue using array
- Program to represent sparse matrix manipulation using arrays.
- Program to allocate two dimensional arrays dynamically.
- Program to demonstrate the use of realloc().
- Program to represent Singly Linked List.
- Program to represent Doubly Linked List.
- Program to represent Circular Linked List.
- Polynomial addition using Linked List.
- Polynomial multiplication using linked list.
- Implement a linked stack
- Program to represent Queue using linked list
- Represent a graph using linked list.
- Program for Conversion of infix to postfix.
- Program for Evaluation of Expressions.
- Program for binary search tree using recursion.
- Program to represent Binary search Tree Traversals without recursion.
- Program to represent Searching procedures (Linear search and Binary search)
- Program to represent sorting procedures (Selection , Bubble , Insertion)

SEMESTER 3

MCA301 DESIGN AND ANALYSIS OF ALGORITHMS

Module 1

Introduction: Algorithm, Concepts in performance analysis – space complexity and time complexity, Asymptotic Notations
Sorting: Analysis of - Bubble sort, Selection sort and Insertion sort
Searching: Analysis of - Linear Search, Binary Search and Interpolation Search.
Hashing Techniques: Different hashing functions, methods for collision handling.

Module II

Divide And Conquer Strategy General method, Finding the maximum and minimum, Analysis of Binary search, Quick sort and Merge sort
Branch and Bound: Travelling Sales man Problem
Backtracking: The 8 queens problem, sum of subsets.

Module III

Dynamic Programming: Introduction, Drawback of Recursion, Elements of Dynamic Programming, Matrix Chain Multiplication and Longest Common subsequence
Greedy Algorithms: Huffman Codes, Activity Selection Problem, Elements of Greedy Strategy, 0-1 knapsack problem, fractional knapsack problem

Module IV

Graph Algorithms: Breadth First Search, Depth First Search.
DFS: Strongly Connected Components and Topological Sort
Minimum Spanning tree:Kruskal and Prims algorithms,
Shortest path: Single Source Shortest path(Dijkstra's Algorithm) and all pair shortest path.

Module V

Number Theoretic Algorithms: Strassen's matrix multiplication.
NP Hard and NP Complete Problems: Basic concepts, non-deterministic algorithm, class of NP- hard and NP- complete
Approximation Problems: Basic terminology, vertex coloring problem – different approximation algorithms, travelling sales man problem

References

- Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest
- Fundamentals of algorithms - Gilles Brassard, Paul Bratley (PHI),C1996
- Introduction to the design and analysis of algorithms - AnanyLevitin (Pearson),2011

MCA302 DATA COMMUNICATIONS AND COMPUTER NETWORKS

Module 1

Introduction: Data Communications, Computer Networks, Network Layering- Principles of Layering, OSI reference Model, TCP-IP Protocol Suite.

Physical Layer: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate Limits. Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to-Analog Conversion, Analog-to-Digital Conversion

Module 2

Physical Layer: Transmission and Switching Transmission Modes, Transmission media- Guided, unguided media. Multiplexing, Switching-Circuit Switching, packet switching

Module 3

Data Link Layer: Nodes and Links, Link-Layer Addressing, error Detection and Correction- Block coding, Cyclic Codes, Checksum, Forward Error Correction, HDLC, PPP

Media Access Control: Random Access-ALOHA, CSMA, CSMA/CD, CSMA/CD, Controlled Access, Channelization-FDMA, TDMA, CDMA.

Module 4

Wired LANS: Ethernet Protocol- IEEE 802. Standard Ethernet- Characteristics, Addressing, Access method. IEEE 802.11, Bluetooth, WiMAX, Cellular Telephony

Network Layer: Services, Routing Algorithms: Distance Vector, Link State, Path Vector, and Unicast Routing Algorithms.

Module 5

Multicasting Basics: Addresses, Delivery at Data Link Layer, Multicast Forwarding, Two Approaches to Multicasting.

Transport Layer: Protocols: Simple, Stop-and-wait, Go-back-N, Selective Repeat, and Bidirectional.

References

- Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill, 2013.
- Andrews. Tanenbaum, "Computer Networks", 5th edition . Prentice-Hall.
- William Stallings, "Data and Computer Communication", 8th edition

MCA 303 SYSTEM SOFTWARE AND COMPILER DESIGN

Module I

General concepts-Review of assembly and machine language programming, distinction between system software and application software, Language

processors:- Introduction , Language processing activities. Assemblers:- Elements of Assembly language programming, simple assembly scheme, Pass structure of assemblers, Design of two pass assemblers

Module II

Macros and macro processors:- Macro definition and call, Macro expansion, Nested macro calls, advanced macro facilities, design of macro pre processor Linker-Relocation and linking concepts-self relocating programs. Loader-Types of loaders, Editor-Types of editors-Components of editor-Debug monitor

Module III

Introduction to compiling:- Compilers, Analysis of a source program, the phases of a compiler, Lexical analysis:-The role of the lexical analyzer, Input buffering, specification of tokens Recognition of tokens, Finite automata, Conversion of an NFA to DFA, From a regular expression to an NFA

Module IV

Syntax analysis:- the role of the parser, Context free grammars, writing a grammar, Top down parsing Bottom up parsing, syntax directed translation-syntax directed definition, , Construction of Syntax Tree, L R parsers-LR parsing algorithm, Constructing SLR parsing tables, SLR parsing table

Module V

Intermediate code generation-postfix notation, syntax tree, three-address code, basic blocks and flow graph, the DAG representation of basic blocks, Backpatching, Code optimization:- The principal sources of optimization, optimization of basic blocks, loops in flow graphs, Peephole optimization Code Generations:- Issues in the design of a code generator, simple code generator

References:

- System Programming and operating Systems- D.M.Dhamdhare Tata McGraw Hill
- Compilers Principles, Techniques and Tools- Alfred VAho, Ravi Sethi, Jeffrry D Ullman
- Systems programming- John J Donovan
- System Software- Leland L Beck, Addison Wesley Publishing Company
- A Beck, Leland, *System Software An Introduction to System Programming*, Addison-Wesley, 3rd Edition, 1997, Third Impression, 2008.

MCA 304 JAVA PROGRAMMING

Module 1

Basics of Java: Java - What, Where and Why?, History and Features of Java, Internals of Java Program, Difference between JDK,JRE and JVM, Internal Details of JVM, Variable and Data Type, Unicode System, Naming Convention.

OOPS Concepts: Advantage of OOPs, Object and Class, Method Overloading, Constructor, static variable, method and block, this keyword, Inheritance (IS-A), Aggregation and Composition(HAS-A), Method Overriding, Covariant Return Type, super keyword, Instance Initializer block, final keyword, Runtime Polymorphism, static and Dynamic binding, Abstract class and Interface, Downcasting with instanceof operator ,Package and Access Modifiers, Encapsulation, Object class, Object Cloning, Java Array, Call By Value and Call By Reference

Module II:

Core java Features: String Handling, Exception Handling, Nested classes, Packages and Interfaces
Multithreaded Programming - synchronization, Input/Output - Files - Directory , Utility Classes, Generics, Generic Class, Generic methods.

Module III:

Serialization: Serialization & Deserialization, Serialization with IS-A and Has-A, Transient keyword
Networking: Socket Programming, URL class, Displaying data of a web page, InetAddress class, DatagramSocket and DatagramPacket, Two way communication

Module IV:

JDBC: - Overview, JDBC implementation, Connection class, Statements, Catching Database Results, handling database Queries. Error Checking and the SQLExceptionClass , The SQLWarning Class, JDBC Driver Types, ResultSetMetaData, Using a Prepared Statement, Parameterized Statements, Stored Procedures, Transaction Management
Collection: Collection Framework, ArrayList class, LinkedList class, ListIterator interface, HashSet class

Module V:

Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers, adapter classes and Menus.
Swing: Basics of Swing, JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class, JColorChooser class, JProgressBar class, JSlider class, Displaying Image, JMenu for Notepad, Open Dialog Box
Java applets- Life cycle of an applet - Adding images to an applet - Adding sound to an applet. Passing parameters to an applet. Event Handling.

References

- JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.
- The Complete reference J2SE - Jim Keogh - Tata McGraw Hills

- Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.
- Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.
- Java Programming, John P. Flynt , Thomson Learning, 2Edn.
- Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998
- Patrick Naughton and Herbert Schidt.- The Complete Reference, JAVA fifth Edition Tata McGraw Hill.
- Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley Professional,2003
- Java Servlets IInd edition Karl Moss Tata McGraw Hills
- Professional JSP – Wrox
- Thinking java – Bruce Eckel – Pearson Education Association
- JavaScript: A Beginner's Guide, Second Edition By John Pollock, McGraw-Hill Professional – Publisher

MCA 305 COMPUTER GRAPHICS AND MULTIMEDIA

Module I

Introduction: Applications of Computer graphics- Display Methods-Standard Graphics pipeline-drawing primitives. Basic raster graphics algorithms-line drawing, circle drawing algorithms, filling algorithms, clipping-line clipping, polygon clipping.

Module II

Transformations: Basic 2D transformations –Translation, rotation, Scaling, Reflection, Shear, Composite Transformations. Window to viewport transformation-changing coordinate systems.

Projection: 3D Geometric transformations- Translation, Scaling, Rotation.

Perspective parallel Matrix representation – 3D viewing – 3D clipping

Module III

Representations of 3D Objects :Representation of curves and surfaces –Parametric, Quadric- Bezier, B-Splines, Constructive solid geometry.

Module IV

Illumination models- concepts, Visible surface detection methods- Object space methods and image space methods, Shading models- Flat Gouraud and Phong. Comparison of different shading methods-Ray tracing.

Module V

Multimedia basics: Introduction to Multimedia – Components – Hypermedia – Authoring – Authoring tools – File formats – Color models – Digital Audio representation – Transmission – Audio signal processing – Digital music making – MIDI – Digital video – Video compression techniques – Video performance measurements – Multimedia Databases – Animation – Key frames and tweening

techniques – Principles of animation – Virtual reality – Multimedia for portable devices

(All the Graphics techniques specified should be implemented using OpenGL)

References

- Hearn D., Baker M.P., *Computer Graphics(using OpenGL)*, Prentice- Hall of India 2006.
- Foley J.D. ,Andries van Dam, *Computer Graphics(latest) - Principles and Practice*, Addison-Wesley.
- Angel, Edward. *Interactive Computer Graphics- A Top-down Approach with OpenGL*, Addison-Wesley,1996.
- Computer Graphics using OpenGL F S Hill – Prentice Hall
- Geometric tools for Computer Graphics – Philip J. Schneider and David H. Eberly – The Morgan Kaufman series in Computer Graphics & Modeling
- Tom McReynolds – David Blythe “ Advanced Graphics Programming Using OpenGL” , Elsevier, 2010
- Parag Havaladar and Gerard Medioni, “Multimedia Systems-Algorithms, Standards and Industry Practices”, Course Technology, Cengage Learning, 2010.
- John F. KoegelBufend , “Multimedia systems”, Pearson Education, Delhi, 2002
- Ralf Steinmetz and Klara “Multimedia Computing, Communications and applications”, Pearson Education,2004.
- Mohammad Dastbaz, *Desgning Interactive Multimedia Systems*
- Multimedia – Technology and applications David Hillman Galgotia Publications, Delhi
- Ralf Steinmetz and Klara Nahrstedt “Multimedia Applications”, Springer, 2007.

MCA 306 JAVA LAB

Lab Cycle:

- Program to illustrate class, objects and constructors
- Program to implement overloading, overriding, polymorphism etc.
- Program to implement the usage of packages
- Program to create user defined and predefined exception
- Program for handling file operation
- Directory manipulation in java
- Implement the concept of multithreading and synchronization
- Program to implement Generic class and generic methods
- Applet program for passing parameters

- Applet program for loading an image and running an audio file
- Program for event-driven paradigm in Java
- Event driven program for Graphical Drawing Application
- Program that uses Menu driven Application
- Program to implement JDBC in GUI and Console Application
- Socket programming to implement communications
- Broadcasting program using UDP protocol
- Program for downloading web pages from the internet using URL.

MCA 307 GRAPHICS AND MULTIMEDIA LAB

Lab Cycle

- RASTER GRAPHICS ALGORITHMS: Line drawing algorithms, Circle drawing algorithms
- TWO DIMENSIONAL TRANSFORMATIONS: Display drawing primitives – Draw Polygon surfaces, filling with colors and applying simple transformations like Translation, Scaling, Rotation and applying Composite transformations.
- CLIPPING: Line clipping
- THREE DIMENSIONAL TRANSFORMATIONS: Creation of simple three dimensional objects like cube, cone and cylinder and applying simple transformations like Translation, Scaling, Rotation, Composite transformations
- VISIBLE SURFACE DETECTION: Finding out visible surfaces and removal of hidden surfaces in simple objects using object space and image space algorithms.
- IMAGE EDITING: Image enhancement, Image transformation from color to gray scale and vice versa, Imagemanipulation and Image optimization for web - Usage of editing tools, layers, filters, special effects and color modes. Creation of simple Gif animated images with textual illustrations, Image Compression.

Software:

1. C/C++
2. OpenGL 3.7 (precompiled GLUT libraries 3.7 – Open source)
3. Any open source software like 'GIMP 2.6' / Flash 8.0 / Photoshop

SEMESTER 4

MCA 401 INTERNET PROGRAMMING USING FRAMEWORK

Module 1

.NET Framework: Introduction, Common Language Runtime (CLR) , MSIL, The .NET Framework Class Library

Introduction to C#: structure of a c# program, data types, operators, decision making branching and looping, arrays.

Object oriented programming: Encapsulation, Inheritance, Polymorphism, Properties and indexers, Interfaces, Structures, Enumeration, Namespaces and Access specifiers, Partial classes, Partial methods, Delegates and Events, Attributes and Reflection.

Module II

Advanced .NET: String Handling. Generics, Generic Class, Generic methods, Assemblies –private and shared Assemblies, GAC, exception handling, Multithreaded Programming, synchronization, Input / Output - Files -reading and writing- Directory manipulation.

Data Base Connectivity: ADO.NET Architecture, Understanding the ConnectionObject, Building the Connection String, Understanding the CommandObject, Understanding DataReaders, Understanding DataSets and DataAdapters, DataTable, DataColumn, DataRow, Differences between DataReader Model and DataSet Model, Understanding the DataViewObject, Working with System.Data.OleDb, Using DataReaders, Using DataSets, Working with SQL.NET, Using Stored Procedures

Module III

IO, Object serialization and Remoting: System.IO, Streams, TextWriter, TextReader, BinaryWirter, BinaryReader, Serialized Object Persistence and formatters, binary formatter, soap formatter, Remoting- Distributed Applications, COM/DCOM in Distributed Environment, Drawbacks of DCOM, .NET Remoting - New distributed environment, Advantages & Disadvantages, . Implementing a Simple Remoting Client and Server.

Network programming: Socket programming, TCP/IP, UDP,

Module IV

Windows Programming: Using Textbox, Button, CheckBox, RadioButtons, ComboBox, GroupBox etc., Event handling, Handling mouse and keyboard events, Using menus and multiple windows, Adding a Tab-Control, Anchoring Controls, ListView and TreeView controls, Building an ImageList and add them to the ListView, Using details inside the ListView, Attaching a Context Menu, Adding a TreeView, Creating window services.

DataBae: Windows Database Connectivity

Module V

Web Applications: Introduction to Web Applications, Understanding architecture ASP.NET, Creating ASP.NET Pages – Web Forms, Working with web controls – Button, Textbox etc. , Postback and ViewState concepts, State Management – Cookies, Sessions and Applications, Validation controls, FileUpload, AdRotator, MultiView, Calendar etc.

Web Database Connectivity: sqldatasource-insert, delete, update, report generation. Concept of Master pages and web services.

References

- C# 2012 Programming, Covers .Net 4.5, Black Book
- Professional .NET programming - wrox publication
- Professional ASP.NET 4.5 in C# - Jason N. Gaylord (Author), Christian Wenz (Author), Pranav Rastogi (Author), Todd Miranda (Author),
- Professional C# Web Services: Building .NET Web Services with ASP .NET and .NET Remoting - Zach Greenvoss and Christian Nagel

MCA 402 BUSINESS PROCESSES & INFORMATION SYSTEMS

Module I : Organizations, Management , and The Networked Enterprise

Why Information Systems ? What is an Information System ? The new Role of Information Systems in Organizations : Towards the Digital Firm, Major Types of Systems in Organisations, Systems from a Functional Perspective : Sales and Marketing, Manufacturing and Production Systems, Finance and Accounting Systems, Human Resources Systems, Enterprise Applications. Strategic Information Systems

Module II : Managing Knowledge, Enhancing Management Decision Making

Systems as Planned Organisational Change, Business Process Reengineering and Process Improvement, Total Quality Management and Six Sigma, Knowledge Management in the Organization- Capturing Knowledge : Expert Systems, , Decision Support Systems, Intelligent techniques

Module III: Managing Information Systems

Ecommerce , categories of E-Commerce, Electronic payment Systems, Content Management Systems, Information Systems Security and Control- Systems Vulnerability and Abuse, Creating a Control Environment- Disaster Recovery Plan, Ethical and Social Issues related to Systems – Ethics in an Information Society, Moral Dimensions of Information Systems

Module IV : Organizations, Business Processes, and Information Systems

The Modern Global Business Environment, Global Competition, The Information Revolution, The Knowledge Worker, Key Business Processes, The Functional Organizational Structure, The Silo Effect, Delays in Executing the Process, Excess

Inventory, Lack of Visibility across Processes, The Importance of Information Systems, Data and Information, Functional Information Systems, Enterprise Systems, Why Is This Information Important to You?, Flows in Business Processes, The Roles of Enterprise Systems in Organizations, Execute the Process, Capture and Store Process Data, Monitor Process Performance, Financial Impact of Process Steps

Module V - ERP

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP. ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool a case study

References :

- Management Information Systems – Managing the Digital Firm : Kenneth C. Laudon, Jane P. Laudon , 8th Edition , Prentice Hall of India
- Management Information Systems, Effy Oz, Thomson Learning , 5 Edn
- Information Systems for Modern Management by Robert G. Murdick, Joel E. Ross & James R. Claggett , 3rd Edition , Prentice Hall of India
- Management Information Systems : Solving Business Problems with Information Technology: Gerald V. Post, David L. Anderson, Tata McGraw-Hill Publishing Co. Ltd.
- Management Information Systems - Managerial perspective by D.P. Goyal, Macmillan India
- Management Information Systems – Mahadeo Jaiswal , Monika Mittal , Oxford University Press
- Essentials of Business Processes and Information Systems- Simha R. Magal, Jeffrey Word
- Alexis Leon, “ERP Demystified”, Tata McGraw Hill
- Rahul V. Altekar “Enterprisewide Resource Planning”, Tata McGraw Hill,

MCA 403 OBJECT ORIENTED MODELING AND DESIGN

Module 1

Concepts: - Objects, Attributes and Methods, Encapsulation and Information Hiding Messages, Class Hierarchy, Inheritance, Polymorphism, Genericity. Object Oriented System Development, Methodology.

Module 2

Unified Modeling Language:- Introduction, UML diagrams, Class diagrams, Use-Case Diagrams, UML Dynamic Modeling.

Module 3

Analysis:- Object Oriented Analysis Process, Object Analysis: Classification, Identifying Relationships, Attributes & Methods.

Module 4

Design:- The Object Oriented Design process & design Axioms, Designing classes, Access layer: Object Storage & Object Interoperability, View Layer: Designing Interface.

Module 5

Implementation:- S/W Implementation, Component diagrams, Deployment diagrams, S/W Testing and Maintenance.

References:-

- Object-Oriented Modeling and Design., Rumbaugh, Blaha, Lorensen., Pearson Education
- Object Oriented System Analysis and Design, Satzinger, Thomson Learning 1Edn.
- Object Oriented System Development using the Unified Modeling Language., Bahrami A., McGraw-Hill
- Page-Johns, Meilir., Fundamentals of Object oriented Design in UML, Pearson Education Asia,2000.
- Object Oriented System Analysis and Design using UML., Bennet, McRobb and Farmer., McGraw-Hill
- The Unified Modeling Language *Reference Manual.*, Rumbaugh, Jacobson and Booch., Pearson Education Asia.

MCA 406 INTERNET PROGRAMMING USING FRAMEWORK LAB

Lab Cycle

- Object oriented program for
 - Polymorphism using class and interfaces
 - Inheritance
 - Properties and indexes
 - Delegates, events and reflections
 - Partial classes and methods
- Threading
 - Creation
 - Multithreading
 - Synchronization
- File handling and Directories

- File reading, writing and copying
- Directory operations
- Assembly
 - Concept of dll
 - Private assembly
 - Shared assembly
- Data base
 - All operations console based
 - Using assemblies
- Remoting and Client Server programming
 - Distributed applications
 - Remoting database application
 - Client server
 - Broadcasting
- Windows applications
 - Forms and controls
 - Windows database connectivity
 - Windows services
- Web applications
 - Post and get
 - View state, Session, cookie and application
 - Web database
 - Web service
 - Master pages

MCA 407 MINI PROJECT

The objective of the Mini Project Lab are

- To introduce the fundamental concepts, structures, operations and functions of different components of Databases and a software application devised for user interface.
- To analyze the design and implementation of a database
- To learn the connectivity of the front end with the back end
- To use the various user interface objects in the design of Forms and Reports
- To implement insertion , deletion , updating and search in a database
- To understand the issues involved in the operation of a DBMS including query processing, security and integrity

Socially relevant system automation is desirable.

SEMESTER 5

MCA 501 DATA MINING

Module I

Introduction

Data Warehousing, Multidimensional Data Model, OLAP Operations ,
Introduction to KDD process, Data mining, Data mining -On What kinds of Data,
Data mining Functionalities, Classification of Data mining Systems.

Data Preprocessing

Data Cleaning, Data Integration and Transformation, Data Reduction, Data
discretization and concept hierarchy generation

Module II

Exploring Data and Visualization Techniques

General Concepts, Techniques, Visualizing Higher Dimensional Data, Tools

Association Analysis

Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods

:Apriori Algorithm, Generating association Rules from Frequent Item sets,

Improving the Efficiency of Apriori. Mining Frequent item-sets without

Candidate Generation, Evaluation of Association Patterns, Visualization.

A Case Study on Association using Orange Tool

Module III

Classification

Introduction to Classification and Prediction, Classification by Decision Tree

Induction: Decision Tree induction, Attribute Selection Measures, Tree Pruning,

Bayesian Classification: Bayes' theorem, Naïve Bayesian Classification, Rule

Based Algorithms: Using If - Then rules of Classification, Rule Extraction from a

Decision Tree, Rule Induction Using a Sequential Covering algorithm, K- Nearest

Neighbour Classifiers, Support Vector Machine. Evaluating the performance of a

Classifier, Methods for comparing classifiers, Visualization.

A Case Study on Classification using Orange Tool

Module IV

Prediction

Linear Regression, Nonlinear Regression, Other Regression-Based Methods

Cluster Analysis : Basic Concepts and Algorithms

Cluster Analysis, Requirements of Cluster Analysis' Types of Data in Cluster

Analysis, Categorization of Major Clustering Methods, Partitioning Methods :k-

Means and k- Medoids, From K-Medoids to CLARANS

A Case Study on Clustering using Orange Tool.

Module V

Cluster Analysis :Advanced Hierarchical Method : Agglomerative and Divisive Hierarchical Clustering, BIRCH, ROCK, Cluster Evaluation, Prototype based Clustering, Density-Based Method: DBSCAN, Grid Based Methods: STING: Statistical Information Grid, Wave Cluster, Model based Methods-Expectation-Maximization, Conceptual Clustering, Neural Network Approach, Visualization.

References:

- Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 'Introduction to Data Mining'
- Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
- G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
- Making sense of Data: A practical guide to exploratory Data Analysis and Data Mining-Glenn J Myatt

MCA 502 LINUX ADMINISTRATION, MANAGEMENT AND NETWORKING

Module 1

Installation and Configuration

Duties of System Administrator, Standard Installation: Exploring Components, Checking supported Hardware, Creating the Boot Disk, Starting the Installation, Partitioning the Hard Disk, Using Disk Druid, Configuring the Installation, Package Installation. System Startup and Shutdown: Examining the boot process, Exploring Run-levels, Starting Programs at System Boot, Shutting down the System, GRUB Configuration. The File System Explained: Understanding File System Structure, Working with Linux File System, Memory and Virtual File System, Linux Disk Management, Linux Commands- Basic commands, redirection, filters.

Module 2

Shell Scripting- introduction to shells, editors, programming constructs, variables. Scripting

Expanding the System

Installing and Upgrading Software Packages: Using Package Manager, Checking versions, Obtaining newer softwares, Installing software from source. Hardware Device Installation, Device Information, udev, Device Files

Module 3

Linux Management -I

Configuring System at the Command Line: Managing Processes, Maintaining the File System, Time Keeping, Automating Scripts using at and cron jobs.
Administering Users and Groups: Administering User Accounts, Working with Group Accounts, Understanding the Root Account, Implementing Sudo, Using File System Quotas

Module 4

Linux Management-II

Backing Up and Restoring the File System: Creating a Backup Plan, Choosing Media for backup Understanding backup Methods, Using Backup Tools - Command line tools, Performance Monitoring: Tools, Measuring Memory Usage, Viewing Running Tasks using ps and top, Monitoring I/O Activity, Using sar.

Module 5

Networking

Network File System: NFS Overview, NFS, Installation, Configuring NFS Server, Configuring NFS Client, Using Automount Services. Network Information System: Understanding , Planning and Configuring NIS Server and NIS Client. Installing Samba, Creating Samba Users, Starting Samba Server and Connecting to Samba Client. Configuring BIND: DNS-Understanding DNS, Configuring server files, Checking the configuration. Configuring Sendmail. Configuring FTP Services.

References:

- Linux Bible, 9th Edition, Christopher Negus, 2015
- Collings Terry and Wall Kurt, *Red Hat Linux Networking & System Administration*, Wiley Indian, 3rd Edition, reprint 2009.
- Petersen Richard, *The Complete Reference: Fedora 7 & Red Hat Enterprise Linux*, Tata McGraw Hill Edition, 2007.
- Richard Peterson, *Redhat6 :Desktop and Administration* , Surfing Turtle press , 2010.
- Soyinka Wale, *Linux Administraiton: A Beginner's Guide*, 5th Edition, 2008.

MCA 503 PARALLEL PROGRAMMING

Module 1

Introduction to multiprocessors and scalability issues: Scalable design principles - Principles of processor design - Instruction Level Parallelism, Thread level parallelism. Parallel computer models -- Symmetric and distributed shared memory architectures - Performance Issues - Multi-core Architectures - Software

and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture.

Module II:

Parallel Programming: Fundamental concepts –Introduction to parallel programming – data parallelism – functional parallelism –pipelining – Flynn's taxonomy – parallel algorithm design – task/channel model –Foster's design methodology – case studies: boundary value problem – finding themaximum – n-body problem – Speedup and efficiency – Amdahl's law – Gustafson-Barsis's Law – Karp-Flatt Metric – Isoefficiency metric

Designing for threads – scheduling – Threading and parallel programming constructs – Synchronization – Critical sections – Deadlock. Threading APIs.

Module III:

OpenMP Programming: OpenMP – parallel for loops – parallel for pragma – private variables – critical sections – reductions – parallel loop optimizations – generaldata parallelism – functional parallelism – Threading a loop – Thread overheads – Performance issues – Library functions. Solutions to parallel programming problems – Data races, deadlocks and live locks – Non-blocking algorithms – Memory and cache related issues – Shared-memory model – case studies: the sieve of Eratosthenes,Floyd's algorithm, matrix-vector multiplication – distributed shared-memory programming– DSM primitives.

Module IV:

MPI Programming: MPI Model – collective communication – data decomposition – communicators and topologies – point-to-point communication – MPI Library. The message-passing model – the message-passing interface – MPI standard – basicconcepts of MPI: MPI_Init, MPI_Comm_size, MPI_Comm_rank, MPI_Send, MPI_Recv,MPI_Finalize – timing the MPI programs: MPI_Wtime, MPI_Wtick – collectivecommunication: MPI_Reduce, MPI_Barrier, MPI_Bcast, MPI_Gather, MPI_Scatter –case studies.

Module V:

Multithreaded Application Development: Algorithms, program development and performance tuning.

Sorting algorithms – quicksort – parallel quicksort – hyperquicksort – sorting by regularsampling – Fast fourier transform – combinatorial search – divide and conquer – parallelbacktrack search – parallel branch and bound – parallel alpha-beta search.

Introduction to parallel programming – MatLab and CUDA.

References

- Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
- Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Macgraw Hill, 2003.
- John L. Hennessey and David A. Patterson, “ Computer architecture – A quantitative approach”, Morgan Kaufmann/Elsevier Publishers, 4th. edition, 2007.

David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/ software approach” , Morgan Kaufmann/Elsevier Publishers, 1999.

MCA 506 LINUX LAB

Lab Cycle

Part 1 Commands

1. File comparison
2. Mathematical
3. Communication
4. Process related commands
5. File compression and backup
6. Shell scripting
7. Special Parameters
8. Environmental variables

Part 2 Shell Scripting

1. Basics of shell programming,
2. Shell programming in bash - Conditional and looping statements,
3. Iterations,
4. Command Substitution - expr command, arithmetic expansion, parameter passing and arguments
5. Shell variables, system shell variables, shell keywords, Creating Shell programs for automating system tasks.

Part 3 Linux administration

- Installation and Configuration of Linux
 - Creating the Boot Disk

- Partitioning the Hard Disk
- Using Disk Druid, Configuring the Installation, Package Installation.
- Exploring Run-levels, Starting Programs at System Boot, Shutting down the System, GRUB Configuration.
- Installing and Upgrading Software Packages
- Installing software from source.
- Hardware Device Installation,
- Managing Processes, Maintaining the File System,
- Automating Scripts using at and cron jobs.
- Administering Users and Groups: Administering User Accounts,
- Working with Group Accounts
- Backing Up and Restoring the File System
- Using Backup Tools - Command line tools,
- Performance Monitoring: Tools,
- Monitoring I/O Activity, Using sar.
- Installing Samba, Creating Samba Users,
- Starting Samba Server and Connecting to Samba Client.
- Configuring server files, checking the configuration.

MCA 507 SPECIALIZATION LAB

The students can undertake a research based/ live project based on the specialization track they chose and can evaluated similarly to Mini Project criteria.

SPECIALIZATION TRACK 1: KNOWLEDGE ENGINEERING

POOL 1

MCA 411 DATA WAREHOUSING

Module 1:

Introduction to Data Warehouse: Basic elements of the Data Warehouse: Source system-Data staging Area-Presentation Server-Dimensional Model-Business process-Data Mart-Data warehouse.

Data Warehouse Design: The case for dimensional modeling – Putting Dimensional modeling together: the data warehouse bus architecture – Basic dimensional modeling techniques.

Module 2:

Data Warehouse Architecture: The value of architecture – An architectural framework and approach – Technical architecture overview – Back room data stores – Back room services. Back Room Services.

Data Staging: Data staging overview – Plan effectively – Dimension Table staging – Fact Table loads and warehouse operations – Data quality and cleansing – issues.

Module 3:

Metadata: Metadata, metadata interchange initiative, metadata repository, metadata management, implementation examples, metadata trends, reporting and query tools and applications- tool categories, the need for applications.

OLAP: Operational Data Store-OLAP: ROLAP, MOLAP and HOLAP. Need for OLAP, multidimensional data model, OLAP guidelines, multidimensional versus multi relational OLAP, categorization of OLAP tools.

Module 4:

Building a data warehouse: Business considerations, Design considerations, technical considerations, implementation considerations, integrated solutions, benefits of data warehousing, Relational data base technology for data warehouse, database architectures for parallel processing, parallel RDBMS features, alternative technologies

Module 5:

DBMS schemas for decision support :Data layout for best access, multidimensional data model, star schema, STARjoin and STARindex, bitmapped indexing, column local storage, complex data types, Data extraction, clean up and transformation tools-tool requirements, vendor approaches, access to legacy data, vendor solutions, transformation engines

References:

- [1] Kimball Ralph,Reeves,Ross,Thronthwaite ,”The Data warehouse lifecycle toolkit”, Wiley India, 2nd Edition, 2006.
- [2] Berson Alex, Stephen J Smith, “Data Warehousing, Data Mining and OLAP”,TATA McGraw-Hill, 13th reprint 2008.

- [3] Soumendra Mohanty, "Data Warehousing design, development and Best practices", TATA McGraw-Hill, 4th reprint 2007.

MCA 412 DIGITAL IMAGE PROCESSING

Module 1

Fundamentals of Image Processing: Introduction – Elements of visual perception, Steps in Image Processing Systems, image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats. Introduction to the Mathematical tools.

Module 2

Image Enhancement and Restoration : Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT, Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.

Module 3

Image Segmentation and Feature Analysis: Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Feature Analysis and Extraction.

Module 4:

Multi Resolution Analysis and Compressions: Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets.

Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards – JPEG/MPEG.

Module 5:

Applications of Image Processing: Representation and Description, Image Recognition-Image Understanding – Image Classification – Video Motion Analysis – Image Fusion – Steganography – Colour Image Processing.

References:

- Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008.
- Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Third Edition, Brooks Cole, 2008.
- Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall India, 2007.

- Madhuri A. Joshi, 'Digital Image Processing: An Algorithmic Approach', Prentice-Hall India, 2006.
- Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", First Edition, Pearson Education, 2004.

MCA 413 SOFT COMPUTING

Module 1

Fuzzy Logic: Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations.

Module 2

Propositional logic and Predicate logic, fuzzy If - Then rules, fuzzy mapping rules and fuzzy implication functions, Applications.

Module 3

Neural Networks: Basic concepts of neural networks, Neural network architectures, Learning methods, Architecture of a back propagation network, Applications.

Module 4

Genetic Algorithms: Basic concepts of genetic algorithms, encoding, genetic modeling.

Module 5

Hybrid Systems: Integration of neural networks, fuzzy logic and genetic algorithms.

References:

- S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India.
- K.H.Lee.. First Course on Fuzzy Theory and Applications, Springer-Verlag.
- J. Yen and R. Langari.. Fuzzy Logic, Intelligence, Control and Information, Pearson Education.

POOL 2

MCA 511 BIG DATA ANALYTICS

Module 1: INTRODUCTION TO BIG DATA

Introduction to BigData Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions – ReSampling - Statistical Inference - Prediction Error.

Module 2: DATA ANALYSIS

Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

Module 3: MINING DATA STREAMS

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.

Module 4: FREQUENT ITEMSETS AND CLUSTERING

Mining Frequent Itemsets - Market Based Model - Apriori Algorithm - Handling Large Data Sets in Main Memory - Limited Pass Algorithm - Counting Frequent Itemsets in a Stream - Clustering Techniques - Hierarchical - K-Means - Clustering High Dimensional Data - CLIQUE And PROCLUS - Frequent Pattern based Clustering Methods - Clustering in Non Euclidean Space - Clustering for Streams and Parallelism.

Module 5: FRAMEWORKS AND VISUALIZATION

MapReduce - Hadoop, Hive, MapR, Hadoop Distributed File Systems - Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages- Approaches to modeling in Analytics - correlation, regression, decision trees, classification, association intelligence from unstructured information-Text analytics

References:

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
- Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
- Pete Warden, "Big Data Glossary", O'Reilly, 2011.

MCA 512 INFORMATION RETRIEVAL TECHNIQUES

Module 1: INTRODUCTION

Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation – Word Sense Disambiguation

Module 2: QUERYING

Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages

Module 3: TEXT OPERATIONS AND USER INTERFACE

Document Preprocessing – Clustering – Text Compression – Indexing and Searching – inverted files – Boolean Queries – Sequential searching – Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points – Query Specification – Context – User relevance Judgment – Interface for Search

Module 4: MULTIMEDIA INFORMATION RETRIEVAL

Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction

Module 5: APPLICATIONS

Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards. Case study - Google search engine

REFERENCES

- Ricardo Baeza-Yate, Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, Pearson Education, 2011.
- G.G. Chowdhury, “Introduction to Modern Information Retrieval”, Neal-Schuman Publishers; 2nd edition, 2003.
- Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Pearson Education, 2000
- David A. Grossman, Ophir Frieder, “ Information Retrieval: Algorithms, and Heuristics”, Academic Press, 2000
- C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
- Anand Rajaraman and Jeffery D. Ullman, “Mining the Massive”, Cambridge University Press, 2008.

MCA 513 SOCIAL MEDIA MINING

Module 1:

Introduction-New Challenges for Mining, Graph basics- Graph Representation , Types of Graphs, Connectivity in Graphs, Special Graphs, graph algorithms, Network measures-centrality, transitivity and reciprocity, balance and status, similarity, Network Models -Properties of Real-World Networks, Random Graphs, Small-World Model , Preferential Attachment Model

Module 2:

Data Mining Essentials- Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning , Unsupervised Learning

Module 3:

Communities and Interactions- Community Analysis, Community Evolution, Community Evaluation Information Diffusion in Social Media- Herd Behavior, Information Cascades , Diffusion of Epidemics

Module 4:

Influence and Homophily- Measuring Assortativity , Influence, Homophily , Distinguishing Influence and Homophily
Recommendation in Social Media- Challenges , Classical Recommendation Algorithms, Recommendation Using Social , Evaluating Recommendations

Module 5:

Behavior Analytics- Individual Behavior, Individual Behavior Analysis, Individual Behavior Modelling, Individual Behavior Prediction, Collective Behavior

References

- *Social Media Mining- An Introduction*, Reza Zafarani, Mohammad Ali Abbasi. Huan. Cambridge University Press, 2014
- *Mining of Massive Datasets*, Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman,

SPECIALIZATION TRACK 2: PROGRAMMING SERIES

POOL 1

MCA 421 J2EE

Module 1

Web Technology: HTML, CSS, JavaScript
Basics of Servlet: Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTPGET Requests, Handling HTTPPOST Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, GenericServlet, HttpServletServletRequest, Servlet Collaboration, ServletConfig, ServletContext
Session Tracking: Session, Cookies, Application. Servlet data base connectivity

Module II:

JSP Technologies: Understanding the Client-Server Model, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries
Session Tracking: Session, Cookies, Application. JSP Database connectivity, Java bean using JSP

Module III:

RMI: RMI Architecture, Designing RMI application, Executing RMI application
Common Object Request Broker Architecture (CORBA): Technical/ Architectural Overview, CORBA Basics, CORBA services
JNI: Java Native Interfaces

Module IV:

Introduction to J2EE: j2ee Components, j2ee clients, web components, j2ee SDK Tools.
EJB: Types of Enterprise Java beans- Session Bean, Entity Bean and Message Driven Beans, Features of Session Bean, Life-cycle of State full Session Bean, Features of Entity Bean, Life-cycle of Entity Bean,
Persistence: Bean managed Persistence and Container Managed Persistence ,

Module V:

Java Messaging Services: topic, Queue
Enterprise JavaBeans Query Language: Syntax, simple finder queries, Full Queries, EJBQL Restrictions
Transactions: Introduction, Container-managed Transactions, Bean-managed Transactions

References

- JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.
- The Complete reference J2SE - Jim Keogh - Tata McGraw Hills

- Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.
- Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.
- Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998
- Patrick Naughton and Herbert Schidt.- The Complete Reference, JAVA fifth Edition Tata McGraw Hill.
- Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley Professional,2003
- Java Servlets IInd edition Karl Moss Tata McGraw Hills
- Professional JSP - Wrox
- Thinking java - Bruce Eckel - Pearson Education Association
- JavaScript: A Beginner's Guide, Second Edition By John Pollock, McGraw-Hill Professional - Publisher
- J2EE Unleashed - Joseph j. Bambara, Paul R.Allen (Techmedia)
- Professional J2EE Projects - Jain , Siddiqui

MCA 422 OPEN SOURCE LAB- PHP

Module 1:

PHP Basics- Syntax, Operators, Variables, Constants, Control Structures, Language Constructs and Functions.

Functions- Syntax, Arguments, Variables, References, Returns, Variable Scope

Module 2:

Arrays- Enumerated Arrays, Associative Arrays, Array Iteration, Multi-Dimensional Arrays, Array Functions, SPL.

Module 3:

Object Oriented Programming- Instantiation, Modifiers/Inheritance, Interfaces, Exceptions, Static Methods & Properties, Autoload, Reflection, Type Hinting, Class Constants.

Strings and Patterns- Quoting, Matching, Extracting, Searching, Replacing, Formatting

Module 4:

Web Features- Sessions, Forms, GET and POST data, Cookies, HTTP Headers
Databases and SQL - SQL, Joins, Analyzing Queries, Prepared Statements, Transactions.

Module 5:

Streams and Network Programming- Files, Reading, Writing, File System
Functions, Streams
Sample web applications using PHP

References

- Professional PHP 6 EdcLecky -Thompson, Steven D. Nowicki,ThomasMyerWrox Publishers
- PHP6 and MySQL Bible – Steve Suehring,TimConverse,and Joyce Park Wiley India Pvt.Ltd

MCA 423 ANDROID

Module 1

Mobile Computing & Development Introduction: Mobile system architecture and development challenges

The Android Platform: Android SDK Features, Introduction to the development Framework, Android Development Tools, Android Application Life Cycle, Activity, Service, Intent, MVC and User InterfacesApplication Structure: AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts &Drawable Resources, Activities and Activity lifecycle

Module II:

Android Graphical User Interface: Linear Layout, Relative Layout, Table Layout, Grid View, Tab Layout, List View, Custom List View Element, Fragments, Time and Date, Images and media, Composite, AlertDialogs , Toast, PopupMenus:- Option menu , Context menu, Sub menu, menu from xml, menu via code, Application Menu, ActionBar, ActionBar& Tabs, View Pager, Action Bar & View Pager

Module III:

Intents – Explicit Intents, Implicit intents, intents and broadcast receivers, intent filters, Adapters and Widgtes:-ArrayAdapters, BaseAdapters, ListView and ListActivity, Custom listview, GridView using adapters, Gallery using adapters
Notifications: Broadcast Receivers, Services and notifications, AlarmsThreads:- Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsyncTask (in detail)

Module IV:

Databases and Content Providers:-

SQLite Databases: Basics of SQLite DB, Various Data Types, SQLite Queries, Adding / Updating / Deleting Contents of SQLite

Content Providers:- SQLite Programming, SQLiteOpenHelper, SQLiteDatabase, Cursor, Content providers ,Defining and using content providers, Example-Sharing database among two different applications using content providers
Reading and updating Contents, Reading bookmarks

Module V:

Advanced Features:Live Folders, Using sdcards, XML Parsing, JSON Parsing, Maps, GPS, Location based Services, Accessing Phone services (Call, SMS, MMS), Network connectivity services

Hardware Sensors:- Sensors and Sensor Managers, Monitoring device movement and orientation, Environmental sensors,

References

- Professional Android 4 application development – Reto Meier
- Android Wireless Application Development By Lauren Darcey and Shane Conder, Pearson Education, 2nd ed.
- Beginning Android Application Development By Wei-Meng Lee, Wrox Publication
- Unlocking Android Developer’s Guide By Frank Ableson and Charlie Collins and Robi Sen, Manning Publication Co.

POOL 2

MCA 521 STRUTS AND HIBERNATE

Module 1

Introduction to Struts MVC Architecture - Framework Application Flow, Components Model, View and Controller, Building a simple web application using struts

Struts Validator - Introduction to validator plugin, Using different types of validators, Configuring the application, Applying validators, Building custom validators,

Declarative exception handling

Framework - Struts Tiles Framework, Introduction to tiles framework, Building tiles configuring struts-config.xml file creating the template page

Struts2 Action - Action Interface, ActionSupport class

Module II:

Basics of Hibernate - Hibernate Introduction, Hibernate Architecture, Understanding First Hibernate application

Hibernate Application - Hibernate with annotation, Hibernate Web application, Hibernate Generator classes, Hibernate Dialects

Hibernate Logging - Hibernate with Log4j 1, Hibernate with Log4j 2

Inheritance Mapping - Table per Hierarchy, Table per Hierarchy using

Annotation, Table Per Concrete, Table Per Concrete using Annotation, Table Per Subclass, Table Per Subclass using Annotation

Module III:

Collection Mapping - Mapping List, One-to-many by List using XML, Many to Many by List using XML, One To Many by List using Annotation, Mapping Bag, One-to-many by Bag, Mapping Set, One-to-many by Set, Mapping Map, Many-to-many by Map, Bidirectional Lazy Collection
Component Mapping
Association Mapping - One-to-one using Primary Key, One-to-one using Foreign Key

Module IV:

Transaction Management
HQL, HCQL, Named Query
Hibernate Caching - First Level Cache, Second Level Cache
Integration - Hibernate and Struts, Hibernate and spring

Module V:

Basics of Spring - What is Spring, Spring Modules, Spring Application
IOC container
Dependency Injection - Constructor Injection, CI Dependent Object, CI with collection, CI with Map, CI Inheriting Bean, Setter Injection, SI Dependent Object, SI with Collection, SI with Map, CI vs SI, Auto wiring, Factory Method
Spring with ORM- Spring with Hibernate, Spring with JPA
SpEL- SpEL, Operators in SpEL, variable in SpEL ,Web Integration- Spring with Struts2

References

- Beginning Apache Struts - Arnold Doray
- Struts: The Complete Reference Book
- Mastering Jakarta Struts
- Struts in Action - Ted Husted, Cedric Dumoulin, George Franciscus, David Winterfeld
- Just Spring Integration - Madhusudhan Konda
- Spring Data - Mark Pollack, Oliver Gierke, Thomas Risberg, Jon Brisbin, Michael Hunger

MCA 522 OPEN SOURCE LAB - PYTHON

Module 1:

Data Types and Data Structures :
Introduction to Python: - using the Python interpreter, Overview of programming in Python, Python built-in types, Arithmetic in Python, Program input and Program output, Variables and assignment.
Strings and string operations, List basics, List operations, Dictionaries, Dictionary basics and Tuples,

Simple programs using elementary data items, lists, dictionaries and tuples.

Module 2:

Control Structures:

Control Statements:-if statements, while statement, for statements, functions, formal arguments, variable-length arguments, Exceptions, detecting and handling exceptions.

Programs using conditional branches, loops.

Programs using functions

Programs using exception handling

Module 3:

Classes ,files and modules

Introduction to Classes and Objects:-classes, class attributes, instances, instance attributes, binding and method invocation, inheritance, polymorphism, Built-in functions for classes and instances.

Files and input/output, reading and writing files, methods of file objects, using standard library functions, dates and times

Programs using classes and objects

Programs using inheritance

Programs using polymorphism

Programs to implement file operations.

Programs using modules.

Module 4:

Database and web programming

Python database application programmer's interface (DB- API), connection and cursor objects, Type objects and constructors, python database adapters.

Creating simple web clients, introduction to CGI, CGI module, building CGI applications, python web application frameworks: django .

Programs using python database API.

Programs for creating simple web pages.

Programs for creating dynamic and interactive web pages using forms.

Module 5:

Development of sample web applications using python.

Sample applications may include

- i) Web based polling*
- ii) Social networking site*
- iii) Online transaction system*
- iv) Content management system*

References

- Core Python Programming by Wesley J. Chun, 2nd Edition , Pearson Education
- An Introduction to Python by Guido Van Russom, Fred L.Drake, Network Theory Limited.

- Beginning Python: From Novice To Professional By Magnus Lie Hetland, Second Edition Apress
- Programming in Python 3 by Mark Summerfield, Pearson Education
- Websites :
 - Online version of An Introduction To Python
 - <http://www.network-theory.co.uk/docs/pytut/>
 - online python tutorials
 - <http://docs.python.org/tutorial/>
 - <http://zetcode.com/tutorials/pythontutorial/>
 - <http://www.sthurlow.com/python/>
 - <http://www.tutorialspoint.com/python/>
- A site for django resources
 - <http://www.djangoproject.com/>
 - Online book on django Framework
 - <http://www.djangobook.com/>

MCA 523 DEVELOPING MOBILE APPLICATIONS WITH IOS PLATFORM

Module 1

Fundamentals of Objective-C programming: Objective-C language basics, Classes and objects, Methods, Instance variables and properties, Dynamic binding and introspection, Foundation framework, Object creation, Memory management, Automatic Reference Counting, Protocols, Categories
iOS SDK: iOS operating system, iOS SDK, Tools of the trade, Model-View-Controller, MVC interaction patterns, View Controllers, iOS aApp Architecture-App behaviour, App life cycle, Background Execution.

Module II:

UIKit views and controls: View Controller lifecycle, UIColor, UIFont, NSAttributedString, UIKit views and controls: UILabel, UIButton, UISlider, UISwitch, UITextField, UITextView, NSNotificationCenter, keyboard notifications

Controllers of View Controllers: Multiple MVCs, UINavigationController, Segues, UITabBarController, Scroll views, Table views, Data source and Delegate, Table view cells, Collection views, Web views

Module III:

Blocks, Concurrency, Networking: Blocks, Concurrency and multi-threading, Grand Central Dispatch (GCD), Networking, UIImage&UIImageView
Core Location and Map Kit: Core Location, Getting the user's location Geocoding, Map Kit, Annotating maps, Segueing programmatically, Working with JSON

Module IV:

Persistent Storage: Property Lists and their limitations, Archiving Objects, Storing on the file-system, SQLite, Core Data Framework, Using properties to access information, Xcode Generated Code for property access, Querying data, Displaying Core Data data in Table Views, Fetch Request, CoreDataTableViewController

Power Management:- Wake locks and assertions, Low-level OS support, Writing power-smart applications

Module V:

Core Data: Core Data, NSManagedObjectContext, UIManagedDocument, NSManagedObject: key-value coding and subclassing, Inserting and deleting objects, Fetching objects, NSFetchedResultsController and UITableView
Sensors and Multimedia: Core Motion, Working with Audio and Video: Media Player framework, System Sound Services, AVFoundation framework, Camera and Photo Library

References

- iOS programming Fundamentals- Matt Neuburg
- iOS 7 Programming Cookbook - VandadNahavandipoor
- App Programming Guide for iOS – Developer [Copyright © 2014 Apple Inc. All Rights Reserved]
- Basic Sensors in iOS-Alasdair Allan
- Beginning iOS 5 Development: Exploring the iOS SDK- David Mark, Jack Nutting and Jeff LaMarche
- Objective-C Programming: The Big Nerd Ranch Guide-By Aaron Hillegass
- Big Nerd Ranch Guides series

SPECIALIZATION TRACK 3: ADVANCED SOFTWARE ENGINEERING

POOL 1

MCA 431 SOFTWARE REQUIREMENTS ENGINEERING

MODULE I

Requirements Engineering

Basics, definition, importance, place of requirements engineering in development process, types of requirements: Functional, non-functional, quality attributes, main requirements engineering activities, documents and processes.

MODULE II

Requirements Elicitation

Requirements inception and elicitation-product vision and project scope, traditional elicitation approaches (interviews, stakeholders study, workshops, ...),scenario/use case approaches, prototyping, requirements negotiation and risk management.

MODULE III

Requirements analysis

Requirements analysis and specification - modeling techniques ,inception vs. specification, techniques for writing high-quality requirements, documentation standards (e.g., IEEE 830-1998),goal-oriented modeling, Structured analysis and other techniques, UML v2 and URN notations, external qualities management, contract specification

MODULE IV

Requirements verification

Requirements verification, and validation, detection of conflicts and inconsistencies, completeness, techniques for inspection, verification and validation, feature interaction analysis and resolution

MODULE V

Requirements management

Requirements management-traceability, priorities, changes, baselines ,tool support (e.g., DOORS),Examples of requirements approaches in typical development processes, requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers

References:

- Ian K. Bray, An Introduction to Requirements Engineering, Addison Wesley, 2002
- Ian F. Alexander, Richard Stevens, Writing better requirements, Addison-Wesley, 2002 - for the topic of how to write requirements

- Elizabeth Hull, Ken Jackson, Jeremy Dick, Requirements Engineering, Springer-Verlag, 2004 - for the topic of tracability and an introduction to the DOORS tool
- Karl E. Wiegers, Software Requirements, Microsoft Press, 2003
- Axel van Lamsweerde, Requirements Engineering: From System Goals to UML Models to Software Specifications, Wiley, 2009.
- Ian Alexander and LjerkaBeus-Dukic, Discovering Requirements: How to Specify Products and Services, Wiley, 2010,
- Klaus Pohl, Requirements Engineering - Fundamentals, Principles, and Techniques, Springer, 2010 (to be published), ISBN 978-3-642-12577-5

MCA 432: SOFTWARE DESIGN AND ARCHITECTURE

Module I

Software Design

Meaning of Software Design ,Goals of software design-correctness , sufficiency , modularity and readability etc , other design goals, Need for a software design notation, Key design principles and heuristics and trade-offs between these. “Bad smells” and refactoring.

Module II

Design Patterns

Introduction to design patterns, history, principles and expectations. Ways of using patterns. Detailed study of a number of representative patterns, Example Application-Applying a design pattern, Summary of design pattern by type-Creational, structural and behavioral .

Module III

Software Architecture

Meaning of software architecture ,Goals for architecture and modularization , Importance of architecture ,Using Façade design pattern, Classical architectural styles such as pipe and filter, data abstraction or OO based, event-based, etc.

Module IV

Frameworks

Meaning and usage of frameworks, goals of framework, framework usages, frameworks as reusable chunks of architecture, the framework lifecycle, development using frameworks, detailed study of some well-known frameworks (e.g. HotDraw).

Module V

Automated evaluation and analysis

Major approaches to automated evaluation and analysis: dynamic analysis (e.g, testing, debugging, model inference, and visualisation) and static analysis (e.g.

call and control graph extractions, metrics calculation, dataflow analysis, type systems, model checking, symbolic execution), and their application and limitations. Construction of tools to support such analysis.

References

- Software Design: From Programming to Architecture. Eric Braude.
- Head First Design Patterns. O'Reilly, Freeman and Freeman.
- Design Patterns. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, . Addison-Wesley, 1995
- An Introduction to Software Architecture. David Garlan and Mary Shaw.
- Refactoring: Improving the Design of Existing Code. Martin Fowler.
- Software Architecture - Foundations, Theory and Practice. Taylor, Medvidovic, Dashofy. Wiley 2009.

MCA 433 SOFTWARE TESTING

Module I

Introduction: Human and errors, Error, Fault, Failure, Incident, Test Cases, Software Quality , Testing and Debugging, Psychology of Testing, General Principles of Testing, Test Metrics.

Module II

Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing. Object Oriented Testing: Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

Module III

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.
Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

Module IV

Test Management
Test Organization ,Test teams, tasks and Qualifications ,Test Planning ,Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria ,Cost and Economy Aspects.

Module V

Testing Tools: Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools.

Case Study –Testing Tool

References:

- William Perry, “Effective Methods for Software Testing”, John Wiley & Sons, New York, 1995.
- CemKaner, Jack Falk, Nguyen Quoc, “Testing Computer Software”, Second Edition, Van Nostrand Reinhold, New York, 1993.
- Boris Beizer, “Software Testing Techniques”, Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
- Louise Tamres, “Software Testing”, Pearson Education Asia, 2002
- Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
- Boris Beizer, “Black-Box Testing – Techniques for Functional Testing of Software and Systems”, John Wiley & Sons Inc., New York, 1995.

POOL 2

MCA 531 SOFTWARE PROJECT MANAGEMENT

Module I

Introduction, Project planning and evaluation-Introduction to software project management: importance, activities, categorization, stakeholders. Stepwise overview of project planning. Program management and project evaluation: allocation of resources, cost benefit analysis, evaluation techniques, risk evaluation.

Module II

Activity Planning -Activity Planning: objectives, projects and activities, sequencing and scheduling activities, network planning models, formulating a network model, forward pass, backward pass, identifying critical path, activity float. Resource Allocation: Identifying resource, requirements, scheduling resources, creating critical paths, cost schedule.

Module III

Monitoring, Control -Monitoring and Control: creating framework, collecting data, visualizing progress, cost monitoring, earned value analysis, priority monitoring, change control, Project Closure-role of Closure analysis, performing closure analysis, closure analysis report.

Module IV

Risk Management-Risk management: categories, risk identification, assessment, planning, management, applying PERT techniques, Monte Carlo simulation, critical chain concepts.

Module V

Project Management-Introduction, Project plan, Milestone checklist, Gantt chart, Project Management tools , Project reviews, Delivery reviews, Scorecards, Certification standards –CMM, PCMM, SIX SIGMA, PMP

References

- Software Project Management: Bob Hughes& Mike Cotterell. 4th Edition, TataMcGrawHill.
- Software Project Management –A Unified Framework: Walker Royce,Pearson Education.
- Software Project Management: Pankaj Jalote, Pearson Education
- Software Project Management –S A Kelkar .Prentice Hall India
- Information Technology and Project Management, Schwalbe, Thomson Learning 4Edn.

MCA 532 USER INTERFACE DESIGN

Module I

Introduction

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles

Module II

Human Computer Interaction

User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice-navigating menus-graphical menus.

Module III

Windows

Windows: Characteristics-components-presentation styles-types-managements-organizations-operations-web systems-device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

Module IV

Multimedia

Text for web pages - effective feedback-guidance & assistance-Internationalization- accessibility-Icons-Image-Multimedia -coloring.

Module V

User Interface design Tools

User interface design tools for Web designing, Mobile apps & Desktop applications. Case study to design user interface for Desktop/Web/Mobile using any tool

References

- Wilbent. O. Galitz ,“The Essential Guide to User Interface Design” , John Wiley& Sons, 2001.
- Ben Sheiderman, “Design the User Interface” , Pearson Education, 1998.
- Alan Cooper, “The Essential of User Interface Design” , Wiley – Dream Tech Ltd., 2002.

MCA 533 SOFTWARE RISK MANAGEMENT AND MAINTENANCE

MODULE I DISCOVERING RISK

Identifying software risk, Classification of Risks – Risk Taxonomy , Risk Mapping, Statements , Risk Reviews, Risk Ownership and stakeholder management

MODULE II RISK ASSESSMENT

Risk Assessment Approach, Risk Assessment tools and techniques, Risk Probability, impact, exposure, matrix and Application Problem- Self- assessment checklist.

MODULE III RESPONDING TO RISKS AND TRACKING

Special Treatment for Catastrophic risks, Constraint Risks, Risk Mitigation Plan Case Study - Contingency Plans, Implementing Risk Response, Tracking Risk Response and Hazards, Triger Levels, Tracking Project Risks and Operational Risks, Learning by Tracking and Risk,Tracker Tool.

MODULE IV MAINTENANCE PROCESS

Software Maintenance, Customer’s Viewpoint- Economics of Maintenance, Issues in

Maintenance, Software Maintenance Standard, Process, Activates and Categories, Maintenance Measurement, Service Measurement and Benchmarking , Problem Resolution- Reporting , Fix Distribution.

MODULE V ACTIVITIES FOR MAINTENANCE

Role of SQA for Support and Maintenance, SQA tools for Maintenance- Configuration
Management and Maintenance – Maintenance of Mission Critical Systems, Global
Maintenance Teams , Foundation of S3m Process Model- Exemplary Practices.

REFERENCES:

- C. Ravindranath Pandian, “ Applied Software Risk Management: A guide for Software Project Managers”, Auerbach Publications, 2007.
- John McManus, “Risk Management in Software Development Projects”, Elsevier
- Buter worth- Heineman, First Editon, 2004.
- Alian April and Alain Abran, “Software Maintenance Management: Evaluation and Continuous Improvement”, John Wiley & Sons Inc, 2008.
- Gopalaswamy Ramesh and Ramesh Bhatiprolu, “Software Maintenance: Effective Practices for Geographically Distributed Environments”, Second Reprint, Tata McGraw- Hill, 2009.

SPECIALIZATION TRACK 4: INFORMATION SECURITY

POOL 1

MCA 441 MATHEMATICAL FOUNDATIONS OF INFORMATION SECURITY

Module I

Mathematical Foundations of Information Security - Abstract Algebra
Fundamentals of Abstract Algebra : Groups, Rings, Fields, Modular Arithmetic,
Euclidean Algorithm, Finite Fields of the form $GF(p)$, Polynomial Arithmetic,
Finite Fields of the form $GF(2^n)$

Module II

Mathematical Foundations of Information Security - Number Theory
Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems,
Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms
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Module III

Private Crypto - Systems.
Introduction to Cryptography, Classical Encryption techniques, Block Ciphers and
Data Encryption Standard. Advanced Encryption Standard, Multiple Encryption
and Triple DES, Block Cipher Modes of operation, Stream Ciphers and RC4,
Confidentiality using Symmetric Encryption,

Module IV

Public Cryptosystems
Public-Key Cryptography and RSA Key Management, Diffie-Hellman Key
Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography,

Module V

Authentication and hash functions
Authentication requirements - Authentication functions - Message Authentication
Codes - Hash Functions, Security of Hash Functions and MACs - MD5 message
Digest algorithm - Secure Hash Algorithm - Authentication Protocols - Digital
Signature Standard

References

- K.H. Rosen, "Elementary Number Theory", Addison-Wesley, ISBN 0-201-57889-1
- Elementary Number Theory William Stein October 2005
- Introduction to Modern Cryptography Mihir Bellare, Phillip Rogaway May 11, 2005
- Handbook of applied cryptography, by A. Menezes, P. Van Oorschot, and S. Vanstone, CRC Press, 1996.
- Stallings, W., Cryptography and Network Security. Principles and Practice, 4th edition, Prentice Hall.

- Steve Burnett & Stephen Paine RSA Security's Official Guide to Cryptography, Tata Mc GrawHill
- Behrouz A. Forouzan, Cryptography & Network Security, Tata McGraw Hill.
- Kaufman, C., Perlman, R., Speciner, M., Network security. Private communication in a public world, Prentice Hall, 2002.
- Trappe, W., Washington, L.C., Introduction to Cryptography with coding theory, Pearson-Prentice Hall, 2006.

MCA 442 WEB AND DATABASE SECURITY

Module I

Introduction to Web Applications and Security, Profiling, Hacking Web Servers, the Threats – Classes of threats, the Hacker's Workbench, Cryptography and the Web, Digital Identifications.

Module II

Privacy- protecting techniques, privacy- protecting technologies, Backups and antitheft. Web Server Security – Host security for servers

Module III

Securing web applications. Protecting an organization – Network layout, safe hosts in a hostile environment, Intrusion detection.

Module IV

Introduction to Database, Levels of Database Security - Human level, network/user interface, database application program, database system, operating system, and physical level, Authentication and Password Security, Application Security – SQL Injection.

Module V

Securing Database-to-Database Communication, Trojans, Encryption, Passwords in scripts, insider/outsider attacks, users, programmers, super users, information leakage.

References

- Joel Scambray, Mike Shema, Caleb Sima, Hacking Exposed Web Applications, Second Edition
- Simson Garfinkel, Gene Spafford, Web Security, Privacy & Commerce, Second Edition
- Mike Shema, HackNotes(tm) Web Security Pocket Reference
- William R. Cheswick, Steven M., Bellovin, Aviel D. Rubin, Firewalls and Internet Security
- Matt Bishop, "Computer Security: Art and Science", Pearson Education.
- Fundamentals of Database Systems (3rd Ed.) - R. Elmasri, S. Navathe
- An Introduction to database systems (5th Ed.) - C. J. Date
- Database system concepts – H. Korth, A. Silberschatz

- Implementing Database Security & Auditing – Ron Ben Vatan
- Security of Data and Transaction- Vijay Atluri, Pierangela Samarati
- Computer Security Lab Manual, Vincent J. Nestler, Wm. Arthur Conklin, Gregory B.

MCA 443 EMERGING SECURITY TECHNOLOGIES

Module I - Introduction

Information Hiding, Steganography, and Watermarking. History of Watermarking. History of Steganography, Importance of Digital Watermarking. Importance of Steganography, Properties of Watermarking and Steganography

Module II - Steganography

Introduction, Exploring Steganography, Steganalysis: Attacks against hidden data, Countermeasures to attacks, Steganography tools

Module III - Digital Right Management (DRM)

DRM, Intellectual Property and Copyright, The Content Revolution, Content Protection and Digital Rights Management Technologies, DRM Systems: Design and implementation.

Module IV - Digital Water Marking (DWM)

Introduction, Applications and Properties of Watermarking Systems, Models of Watermarking, Basic Message Coding, Watermarking with Side Information, Robust Watermarking, Watermark Security.

Module V - Applications

Applications of Watermarking, Broadcast Monitoring, Owner Identification, Proof of Ownership, Transaction Tracking, Content Authentication, Copy Control, Device Control, Legacy Enhancement. Applications of Steganography, Steganography for Dissidents, Steganography for Criminals,

References

- Information Hiding: Steganography and Watermarking: Attacks and Countermeasures, By Neil F. Johnson, Zoran Duric, Sushil Jajodia. Kluwer Academic Publishers, Thirs Printing 2003.
- Investigator's Guide to Steganography, by Gregory Kipper
- Digital Rights Management – Protecting and monetizing content, by John Van Tassel.
- Digital Watermarking and Steganography, Second Edition, by Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker. Morgan Kaufmann Publishers.
- Digital Watermarking and Steganography, Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, and Ton Kalker. 2nd Edition, Morgan Kaufmann Publishers, 2008

POOL 2

MCA 541 NETWORK SECURITY ARCHITECTURE

Module I : Review of wired/wireless network protocols

The transport layer- TCP, UDP- Network layer & Routing, Wireless LAN- 802.11, HyperLAN, Bluetooth, wireless ATM, Mobile Network Layer, Mobile Transport Layer

Module II : Security in Computer Networks

Security, Authentication, Integrity, Key distribution, Certification, Access control, Attacks and counter measures, Security in many layers, intrusion detection systems and malicious software.

Module III: IPSecurity

IP security Architecture, Authentication Header, ESP, Combining Security Associations KeyManagement , IKE.

Module IV: Web Security

SSL/TLS, network management security, wireless security.

Module V : Email Security

MIME ,SMIME, Security services for email , establishing keys , privacy, authentication of source , message integrity , non-repudiation , message flow confidentiality , names andAddresses., PEM, PGP . Comparison of PEM, PGP,& X.400.

References

- C. Kaufman, R. Perlman and M. Speciner, Network Security: Private Communication in a public World, 2/e, Prentice Hall, 2002.
- Kurose J. F. & Ross K. W., Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education Asia, 3/e, 2005.
- Schiller J., Mobile Communications, Pearson Education Asia,2/e, 2004.
- W. Stallings, Cryptography and Network Security Principles and practice, 3/e, Pearson Education Asia, 2003.

MCA 542 WIRELESS SECURITY

Module 1

Review of Wireless fundamentals- Wireless network protocols, Wireless ApplicationProtocol (WAP) - Comparison of the TCP/IP, OSI, WAP model, How WAP works, the securitystatus of WAP

Module 2

Viruses, Authorization, Non-repudiation, Authentication, secure sessions, security products,WAP security Architecture, Marginal Security, Wireless access

to the Internet, WirelessMiddlewareWEP security , RC4 Encryption , Threats-Cracking WEP , Securing the WLAN

Module 3

An Introduction to RFID, The case for RFID, The eras of RFID, Application type, RFIDArchitecture, tags, Middleware , privacy and security A confluence of Technologies, Keyfunctionalities, RFID system components, Architecture guidelines, System Management

Module 4

Wireless Hacking techniques, Wireless Attacks

Module 5

Mobile Security, Securing Wi-Fi , WiMAX , Bluetooth Security, Quality of Service (QoS)

References

- Russel Dean Vines, "Wireless Security Essentials: Defending Mobile from Data Piracy", John Wiley & Sons, First Edition - 2002.
- Cyrus, Peikari, Seth Fogie, "Maximum Wireless Security", SAMS Publishing 2002.
- RFID essentials By Bill Glover, Himanshu Bhatt
- Lawrence Harte, "Introduction to WIMAX ", Althos Publishing, 2005
- Guide to Wireless Network Security, by Vacca
- Network Security: Current Status and Future Directions, by Douligieris and Serpanos
- Security for Wireless Sensor Networks, by Liu and Ning
- Security and Cooperation in Wireless Networks, by Buttyan and Hubaux

MCA 543 CYBER FORENSICS

Module 1

Over View of Computer Forensics Technology- Computer Forensics Fundamentals- Type of Computer Forensics Technology- Type of Vendor and Computer Forensics Services

Module 2

Computer Forensics Evidence and Capture- Data Recovery-Evidence collection and Data Seizure- Duplication and preservation of Digital Evidence-Computer image verification and Authentication

Module 3

Computer Forensics Analysis- Discovery of Electronic Evidence- Identification of data Reconstructing Past events

Module 4

Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies.

Module 5

Countermeasure: Information warfare- Surveillance tool for Information warfare of theFuture-Advanced Computer Forensics

References

- Computer Forensics: Computer Crime Scene Investigation (Networking Series) By John R. Vacca-Charles River Media.
- Hacking Exposed Computer Forensics, Second Edition : Computer Forensics Secrets & Solutions By Aaron Philipp, David Cowen, Chris Davis- McGraw-Hill Osborne Media
- Kenneth C.Brancik “Insider Computer Fraud” Auerbach Publications Taylor & Francis Group–2008.
- Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springer’s, 2010
- Ali Jahangiri, Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts, Ali Jahangiri, 2009
- Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series:Computer Forensics), 2010

Board of Studies

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Subject experts nominated by the academic council

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CUSAT

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