Kristu Jayanti College
of Management & Technology
AUTONOMOUS Bangalore
Accredited 'A' Grade by NAAC | An Institution Managed by CMI Fathers

DEPARTMENT OF COMPUTER SCIENCE(PG)

Master of Computer Applications

Curriculum

2013 - 16 Batch and 2014-2017

http://www.kristujayanti.edu.in

CURRICULUM OVERVIEW

1. Aim

Kristu Jayanti College (Autonomous) offers the postgraduate course, Master of Computer Applications (MCA), approved by AICTE, with the broad objective to produce competitive software professionals with advanced technical knowledge. The students work in an integrated environment that enables them to learn and develop conceptual and analytical skills.

2. Eligibility

Admission to MCA programme is open for the candidates who have passed Bachelor degree with not less than fifty percent i.e. integer 50% (rounding-off of aggregate percent is not permitted) of marks in the aggregate of all the years of the degree examinations with Mathematics/ Statistics/Computer Science/ Computer Programming/ Computer Applications/ Business Mathematics / Business Statistics as one of the optional or elective at Degree Level. Provided further, a candidate who has studied and passed one of the subjects specified in the first provisoin the Pre-University course with 50% of marks in that subject shall be considered for admission. However in the case of candidates from Karnataka belonging to SC/ST and Cat – I, forty five percent i.e. integer 45% (rounding-off of aggregate percent is not permitted) of marks in that subject shall be considered for admission.

3. Credits

The institute follows the concept of credits and one credit is equivalent to 1.5 hours per week. The total credits for the Programme is 140.

Total credits:

5(Semester) x23*+ 20 (Final Project) + Extra Credit 5(Semester) x 1= 140Credits

*Each Semester (Course Credits 21 + VAC Credits 2)

4. Attendance

- A student should have 85 percentage of attendance in each course
- Any student who is not complying to this requirement will not be allowed to appear for End Semester Examination
- In case a student does not appear for the examination due to shortage of attendance, the student has to repeat that semester to make up for the attendance and the student will have to pay the fees for that semester as applicable.

5. Passing Criteria

- No minimum pass mark for CIA
- ESE (End Semester Examination) alone 40% - (40 marks out of 100 / 24 marks out of 60)
- (ESE + CIA) aggregate 50 % or 50 marks out of 100
- Student should achieve the total number of credits assigned for each programme

6. Specialization / Electives

A student will have to take one elective course in III semester and two electives in IV and V Semester

7. Orientation and Bridge Programmes

Orientation Programme

Orientation is offered at the beginning of the programme to familiarize the students with the ambience of the college and its discipline. It basically includes sessions as mentioned below:

- Campus Culture
- Briefing of the academic and examination process
- Life skills and Attitudinal workshops
- Placement Process details

Bridge Programme

Bridge courses are offered on different subjects in order to cope up with the syllabus offered by the programme. Topics covered are

- Basic Problem Solving techniques
- Introduction to Algorithms and Flow Chart

8. Value Added Courses / Certificate Courses

I Semester - Web Designing Lab
II Semester - Soft Skills
III Semester - .NET
IV Semester -J2EE
V Semester - DBA

Aptitude Enhancement and Language Enhancement Training will be conducted as per the requirements.

9. Internship / Project

The students are required to undergo Internship/Project for a period of six months as a part of their final year /VI Semester MCA programme. The final semester project work can be carried out either in the institution or at an Industry/Research Organization approved by the Head of the Department and will be supervised by the faculty members of the department. The report will have to be printed and bound as per specifications and submitted for verification and Viva-voce examination. During the progress of the project work the students should interact with the internal / external guides. Project review will be conducted twice in a month. Internal marks for the project will be based on all the reviews and final demo of the project.

Internal Marks: 50 and External Project Viva – Voce Marks: 150

Internal Marks

Each Review - 5 Marks
(8 Reviews * 5 = 40 Marks)
Preparatory Demo - 10

External Project Viva – Voce Marks

Report	25
Presentation	75
Viva – Voce	50

10. Skill Development Activities

The department offers provisions for students to be a part of the different technical communities which aims at the skill development in the respective domain. The various communities include 'Development' and 'Testing & Administration'

11. Co-curricular Activities

The department organizes the various activities like:

- Manoeuvre: Intra collegiate IT Fest
- Shells: Inter collegiate IT Fest
- Tech Talk : Interaction with Industry Experts
- Industrial Visits
- Guest Lectures
- Workshops

12. Other Activities

- Social Outreach Programme
- Rural Exposure Programme
- Computer Literacy Programme
  – "Sahanavavathu"- Kishore Ganaka Gnana

Course Matrix

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
I	**13MCA1201**	Assembly Language Programming using 8086	4	3	40	60	100
	13MCA1202	Concepts of Computing and Problem Solving	4	3	40	60	100
	13MCA1203	Mathematical foundation of Computer Science	4	3	40	60	100
	13MCA1204	Operating Systems	4	3	40	60	100
	13MCA1205	Managerial Skills for IT Professionals	4	3	40	60	100
	13MCA12L1	Assembly Language Programming Lab	4	3	40	60	100
	13MCA12L2	Programming in C Lab	4	3	40	60	100
	Total		28	21	280	420	700

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
II	**13MCA2201**	Data Structures	4	3	40	60	100
	13MCA2202	Object Oriented Programming with Java	4	3	40	60	100
	13MCA2203	Probability and Statistics	4	3	40	60	100
	13MCA2204	Linux System Programming	4	3	40	60	100
	13MCA2205	Relational Data Base Management System	4	3	40	60	100
	13MCA22L1	Data Structures Lab	4	3	40	60	100
	13 MCA22L2	Java Programming Lab	4	3	40	60	100
	Total		28	21	280	420	700

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
III	**13MCA3201**	Web Technologies	4	3	40	60	100
	13MCA3202	Accounting and Financial Management	4	3	40	60	100
	13MCA3203	Design and Analysis of Algorithms	4	3	40	60	100
	13MCA3204	Software Engineering	4	3	40	60	100
	13MCA3#01	Elective Paper I	4	3	40	60	100
	13MCA32L1	Web Programming Lab	4	3	40	60	100
	13MCA32P1	Software Engineering Mini Project	4	3	40	60	100
	Total		28	21	280	420	700

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
IV	**13MCA4201**	Middleware Technologies	4	3	40	60	100
	13MCA4202	Data Communication and Networks	4	3	40	60	100
	13MCA4203	Object Oriented Analysis and Design using UML	4	3	40	60	100
	13MCA4_01	Elective Paper II	4	3	40	60	100
	13MCA4_01	Elective Paper III	4	3	40	60	100
	13MCA42L1	Network Programming Lab	4	3	40	60	100
	13MCA42P1	Enterprise Computing Project	4	3	40	60	100
	Total		28	21	280	420	700

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
V	**13MCA5201**	Software Project Management	4	3	40	60	100
	13MCA5202	Information Security	4	3	40	60	100
	13MCA5203	Artificial Intelligence and Expert Systems	4	3	40	60	100
	13MCA5_01	Elective Paper IV	4	3	40	60	100
	13MCA5_01	Elective Paper V	4	3	40	60	100
	13MCA52P1	Software Project Management Lab	4	3	40	60	100
	13MCA5_P1	Project on Elective Paper IV	4	3	40	60	100
	Total		28	21	280	420	700

Semester	Paper Code	Title of the Paper	Hours	Credits	CIA	ESE	Total
VI	**13MCA62P1**	Major Project	-	20	50	150	200

Elective Paper I (III SEM)

Paper Code	Title of the Paper
13MCA3A01	System Software
13MCA3B01	Computer Based Optimization Techniques
13MCA3C01	Computer Graphics and Visualization

Elective Paper II (IV SEM)

Paper Code	Title of the Paper
13MCA4A01	Theory of Computation
13MCA4B01	E-Commerce and M-Commerce
13MCA4C01	XML and Web Services

Elective Paper III (IV SEM)

Paper Code	Title of the Paper
13MCA4S01	Data and Knowledge Mining
13MCA4T01	Software Testing and Quality Management
13MCA4U01	Multimedia Communications

Elective Paper IV (V SEM)

Paper Code	Title of the Paper
13MCA5A01	Embedded Systems
13MCA5B01	Compiler Design
13MCA5C01	Simulation and Modeling

Elective Paper V (V SEM)

Paper Code	Title of the Paper
13MCA5S01	Data Analytics
13MCA5T01	Software Testing Tools
13MCA5U01	Digital Image Processing

List of VACs

Semester	VAC	Hours	Credits
I	Web Designing Lab	3	2
II	Soft Skills	3	2
III	.NET	3	2
IV	J2EE	3	2
V	DBA	3	2
Total		15	10

Extra Credits

Semester	Subject	Credits
I – V	Technical Community Presentations	1
	Department Activities Involvement(Intra and Inter Collegiate fest)	1
	Fest(Other college – Inter collegiate fest)	1
	Social Outreach Programme	1
	Aptitude Enhancement Training	1

CIA – Continuous Internal Assessment ESE- End Semester Examination

Total Credits:

5(Semester) x 23*+ 20 (Final Project) + Extra Credit 5(Semester) × 1= 140Credits

*Each Semester (Course Credits 21 + VAC Credits 2)

Marks Split Up

ESE total marks – 60

Question paper pattern discussion (total marks 60)

Either or pattern- 5*12– 60(maximum subdivisions allowed 3)

CIA for Theory

Component	Marks
CIA I - One Mid Term Examination	20
CIA II - One Assignment	5
CIA III - One Seminar	5
CIA IV - Paper presentation / Case Study / Mini Project	10
Total	**40**

CIA for practical's/project (40 marks)

Component	Marks
CIA I - One Mid Term Examination	25
CIA II - Class work/review	10
CIA III - Record/project report	5
Total	**40**

13MCA1201 ASSEMBLY LANGUAGE PROGRAMMING USING 8086

Credits: 3 **Total: 60 Hours**

Objectives:

- To understand the basics of a processor based design by referring to the architectural details, instruction set and machine level programming.
- It helps the learner to optimize the resource (hardware) utilization, while designing any applications using high level programs or operating systems.

Unit1: Number Systems and Logic Gates 12hrs

Counting in Decimal and Binary; Place Value; Binary to Decimal Conversion; Decimal to Binary Conversion; Hexadecimal Numbers; Octal Numbers; Bits; Bytes; Nibbles; and Word Size; Binary Subtraction; Addition and Subtraction; r complement; (r-1) complement; Functional Units; Basic Operational Concepts; Bus structures; Performance; Memory Location and Addresses; Memory Operations

Unit2: Introduction to 8086 Architecture 12hrs

8086 Architecture and Introduction to 16 Bit Processing - 8086 Architecture and programming model; registers; flags; memory segmentation; pin description; odd & even bank of memory; interfacing of memory RAM and EPROM.

Unit 3: 8086 Instruction Template and Addressing Modes 12hrs

8086 Instruction Template and Addressing Modes - Instruction template for 8086 instructions, code generation using template, Immediate addressing, register addressing, memory addressing, indexed addressing with displacement, I/O port addressing.

Unit 4: 8086 Instructions: Data Transfer Instruction 12hrs

8086 Instructions- Data Transfer Instruction: Move data to register/memory from register / memory / immediate data; data transfer between a segment register and register/memory; PUSH and POP; exchange; data transfer with I/O ports. Data Conversion instructions- XLAT, LEA, LDS, LES, LAHF and SAHF instructions. Arithmetic Instructions - Add; subtract; negate; compare; CBW; CWD; multiply and divide instructions. Logical Instructions- AND; OR; EX-OR; Test; NOT; ROTATE and shift instructions. Process Control Instructions -Instructions to set/reset flags; halt; wait; lock; prefix and escape to co-processor instructions. String Instructions – CMPS; MOVS; LODS; STOS; and SCAS instructions. Branch Instructions: JMP; conditional jump; LOOP; LOOPE; LOOPNE; JCXZ; CALL; RET.

Unit 5: Interrupts of 8086 12hrs

Interrupts of 8086: Hardware interrupt; software interrupt and exception; priority of interrupts Assembly language programming: Assembly language programming examples; subroutines and macros; examples.

References:

Daniel Tabak, *Advanced Microprocessors*, (2nd ed.). Tata McGraw Hill Publications.
Douglas, V Hall. *Microprocessors and Interfacing* (2nd Ed.). Tata McGraw Hill

Publications.
Dr.Udayakumar,K and Uma Shankar, B. S, *Advanced Microprocessors and IBM -PC Assembly Language Programming*: Tata McGraw Hill Publications.
Morris Mano, M (2008).*Digital Logic and Computer Design*, (10th ed.). Pearson.
RayBhurchandi,*Advanced Microprocessors and Peripherals, Architecture, Programming and Interfacing.*Tata McGraw Hill Publications.
Tokenism (2004). *Digital Electronics Principles and Applications,* (6thed.). McGraw Hill.
Walter A. Triebel and Avatar Singh, *8088 / 8086 Processors Programming, Interfacing, Software, Hardware and applications*, PHI.

13MCA1202 CONCEPTS OF COMPUTING AND PROBLEM SOLVING

Credits: 3 **Total: 60 Hours**

Objectives:

To gain experience in the C programming language, to compile and execute a C program in a programming environment and to debug C programs.

Unit1: Introduction 12hrs

Basics of Programming- Algorithm; flowchart and pseudo code.
Introduction to C-Development of C; Features; Constants and Variables; Data types; Operators and Expressions; Library functions.
I/O Statements- Formatted and unformatted I/O operations;scanf(),printf(),getchar() and putchar() functions.

Unit 2: Decision Making and Arrays 12hrs

Branching and Looping- Conditional and unconditional; if, for, while and do….while, switch; breakand continue, go to statement.
Arrays- One and multi-dimensional arrays; searching algorithms (linear and binary search); sorting algorithms; Predefined streams.

Unit 3: Functions and String Handling 12hrs

Functions – Definition; different types; advantages; calling a function; passing Parameters call by reference and call by value; local and global variables; function with arrays; recursive functions; The scope of variables in functions; different storage classes
String Handling - String functions; Arithmetic operations on characters;sscanf();sprintf().

Unit 4: Pointers, Structures and Union, and Pre-processor 12hrs

Pointers- Features of Pointers; Pointer Declaration; Arithmetic operations with Pointers; Pointers and Arrays; Pointers and Two dimensional Arrays; Array of Pointers; Pointers to Pointers; Pointers and strings; void pointers.
Structures andUnions - Defining a structure;typedef definitions; array of structures; pointer and structures; passing structures to a function; passing structure pointers to a functions; unionPre-processors- Macro substitution; file inclusion directives; compiler; control directives.

Unit 5: Files and Advanced Concepts in C **12hrs**

Files- Introduction, streams and file types, file operations, input and output operations on files using fprint( ), fscanf( ), fgets( ), fputs( ), getc( ) and putc( ), Unformatted files, fread( ) and fwrite( ), command line arguments

Advanced Concepts in C**:** ROM-BIOS Functions, Invoking ROM-BIOS functions, CPU registers, Interrupts and Interrupt Vector Table, int86 ( ) functions, intdos( ) functions.

References:

Ashok, N and Kamthane, (2012).*Programming in C.*(2nd ed.).Pearson Education

Deitel, H.M. and Deitel, P.J. (2006). *C: How to Program.* (3rded.). New Delhi: Pearson Education.

Schildt, Herbert, (2007).*C*: *The Complete Reference,* (4th ed.). TataMcgraw Hill Publishing Co Ltd,

YashwantKanetkar, *Let us C.* (8th ed.). New Delhi: BPB Publications

13MCA1203 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Credits: 3 **Total: 60 Hours**

Objectives:

- To acquire basic knowledge on various mathematics concepts related to computer programming, network analysis and graphics programming using matrix operations, graph theory, set theory and propositional calculus.

Unit1: Logic, Functions and Relations **15hrs**

Logic; Propositional equivalences; predicates and quantifiers; nested quantifiers; methods of proof; mathematical induction; sets; set operations and functions; integers and division; integers and algorithms; application of number theory; matrices.

Relation**:** n-array relations and applications; representing relations; closures of relations; equivalence relations; partial orderings.

Unit 2: Combinatorics **15hrs**

Counting: basics of counting; pigeonhole principle; permutation and combination; binomial coefficient; generalized permutations and combinations.

Unit 3: Graph Theory **15hrs**

Introduction; representing graphs and graph isomorphism; connectivity; Euler and Hamilton paths; shortest path problems; planar graphs; graph coloring; spanning trees; minimum spanning trees.

Unit 4: Groups, Rings, Fields and Algebras **15hrs**

Introduction to group theory; subgroups; cyclic groups;cosets and Lagrange's theorem; codes and group codes; homomorphism of groups; normal subgroups; rings; integral domain and field(definition and basic properties only,statement of theorems but not proofs); Boolean algebras: Lattices and algebraic systems; basic properties of lattices; types of lattices; Boolean function and Boolean expressions.

References:

Akerkar, Rajendraand Akerkar, Rupali. *Discrete mathematics.* Pearson Education
Biggs, Norman L. *Discrete mathematics*. Oxford University Press.
Kolman, Bushy, Ross. *Discrete mathematical structures*. Pearson Education.
Liu, C.L. (2002). *Elements of discrete mathematics*. TMH (2nd ed.) ISBN 0-07-043476X (Unit 4, chapter 11 and 12)
Rosen, Kenneth H.(2003). *Discrete mathematics and its applications.* TMH,(5th ed.). ISBN 0-07-242434-6 (Unit 1-3)
Scheinerman, Edward R. (2001). *Mathematics - a discrete introduction.* 5th reprint, ISBN 984240-0923, Thompson learning.
Tremblay and Manohar R. *Discrete mathematical structures with its applications to computer science.* Tata Mcgraw Hill, ISBN 00/065142-6

13MCA1204 OPERATING SYSTEMS

Credits: 3 **Total: 60 Hours**

Objectives:

To gain extensive knowledge on the concepts and the principles of the Operating System in a contemporary programming environment

Unit1: Introduction to Operating Systems 11hrs

What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Virtual machines; Operating System generation; System boot.

Unit2: Process Management and Synchronization 13hrs

Process concept; Process scheduling; Operations on processes; Inter-process communication, Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; thread scheduling. Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. Deadlock prevention and avoidance mechanisms.

Unit 3: Memory Management 12hrs

Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

Unit 4: File System, Implementation of File System 12hrs

File System: File concept; Access methods; Directory structure; File system mounting; file sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Unit 5: Secondary Storage Structures and Linux Case Study 12hrs

Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

References:

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, (2012).*Operating System Principles*, (9th ed.). retrieved from http://www.os-book.com/

D.M Dhamdhere, (2002): *Operating systems - A concept based Approach.* (2nd ed.). Tata McGraw- Hill Publications.

Harvey M Deital, (2005): *Operating systems.* (3rd ed.). Pearson Education.

Stallings, William, (2001).*Operating Systems*, (2nded..). Pearson Education Asia.

Tanenbaum, Andrew.S, (2004).*Operating System Design and Implementation.* Pearson Education.

13MCA1205 MANAGERIAL SKILLS FOR IT PROFESSIONALS

Credits: 3 Total: 60 Hours

Objectives:

- To familiarize with the basic managerial concepts related to General Management, Project Management and Human Resource Management
- To understand the foundations for individual and group behavior in organizations
- To acquire the contemporary managerial skills for modern IT professionals

Unit 1: Introduction to Management and Organizations 12hrs

Meaning, nature and importance of management; Management Yesterday and Today. Basic Managerial skills for IT professionals, Principles of management; Major School of Management thought. Organizational Structure and Design.

Unit 2: Management Functions and Techniques 12hrs

Challenges of today's business organizations, Decision-Making: The Essence of the Manager's Job. Foundations of Planning, Importance of planning tools and techniques.

Unit 3: Project Management 12hrs

Project definition – contract management, activities covered by software project management, Operations Management.

Unit 4: Human Resource Management &OrganizationalBehavior 12hrs

Concept and objectives of human resource management. Traditional and modem perspectives in HRM; Basic HR Functions; Contemporary global trends in HRM.

Organizational Behavior: Foundations of individual behavior-personality; perception; learning; values, attitudes and job satisfaction; ability and motivation. Foundations of group behavior; Communication and group decision making; Leadership: power and politics, conflict.

Unit 5:Contemporary Management Competencies for IT Professionals 12hrs

Time Management Skills, Effective Communication Skills, Problem Solving Skills, Crisis Management, Work-Life Balance and Life Skills.

References:

George, Jennifer M., & Jones, Gareth R. (2007).*Contemporary Management (*5th ed.). McGraw-Hill/Irwin.

Robbins, Stephen P, and Coulter, Mary. (2007).*Management*.(9th ed.). Prentice Hall

Whetten, David A., & Cameron, Kim S. (2007) *Developing Management Skills*. (7thed.). Pearson Prentice Hall

13MCA12L1 ASSEMBLY LANGUAGE PROGRAMMING LAB

(All programs to be written using 8086 assembly language)

1. **Familiarization of basic input output monitor modules** (not to be evaluated in exams)
   i. Reading data from keyboard
   ii. Displaying data on LCD panel

2. **Design functionality pertaining to various arithmetic operations**
   i. Perform binary arithmetic operations on 16 bit, 32 bit and 8 bit numbers
   ii. Perform BCD arithmetic operations on 16 bit and 8 bit numbers

3. **Managing variable data width**
   i. Perform binary arithmetic operations on 32 bit and 8 bit numbers
   ii. Perform BCD arithmetic operations on 8 bit numbers

4. **Usage of Memory pointer**
   i. Average of N- 8-bit/16-bit binary and decimal numbers.
   ii. To generate the Fibonacci series up to the given limit
   iii. To find Minimum and maximum out of N numbers
   iv. To sort given N numbers in ascending/descending order

5. **Module and subroutine usages**
   i. To Find the GCD of 2 integer numbers (both binary and decimal)
   ii. To calculate factorial of a given number using recursion technique.
   iii. To generate and print prime numbers up to a limit N (both binary and decimal).

6. **Processing of data from arrays**
   i. To find the Sum and difference of two matrices of order MxN and PxQ
   ii. Reverse of an array of numbers

Note: The programs provided are to be referred only as sample program objectives. Any other programs to evaluate the concept awareness can also be considered for examination.

13MCA12L2 PROGRAMMING IN C LAB

Write C programs to implement the following

1. Conditional operator
2. Bitwise operators
3. Type casting
4. Looping constructs
5. Decision making
6. String Handling
7. Sorting
8. Searching
9. Arrays
10. Functions
11. Recursion
12. Pointers
13. Preprocessor Directives
14. Structure
15. Interrupts
16. Dynamic Memory allocation
17. Files

13MCA2201 DATA STRUCTURES

Credits: 3 **Total: 60 Hours**

Objectives:

To learn the concepts and applications of data structures and enable them to solve problems using various data structures.

Unit 1: Algorithm Analysis and Introduction 12hrs

Pseudo code; The Abstract Data Type; A Model for an Abstract Data Type; Algorithm analysis with Big Oh notation; Data Structure – Definition, Classifications, Operations; Searching - Linear Search and Binary Search Algorithms; Hashed List Searches; Collision Resolution.

Unit 2: Linear Lists 12hrs

Linear List Concepts; Linked List ; Linked List Algorithms; Building a Linked List; implementation; Linked List Abstract Data Type; Processing a Linked List; Linear List Applications; Complex Linked List Structures; Circular and Doubly Linked List; Applications; Josephus Problem.

Unit 3: Stack and Queue 12hrs

Stack: Basic Stack Operations; Linked List implementation; Stack Applications; Conversion of Infix to Postfix; Evaluation of Postfix; Decimal to Binary conversion; Recursive function implementation of factorial; ADT Linked List Implementation; Array Implementation of Stack;

Queue: Operations; Classifications; Linked List Implementation; ADT Linked List Implementation; Applications; Categorizing Data, Queue Simulations; Array Implementation of Queue.

Unit 4: Trees and Graphs 12hrs

Binary Tree: Concepts; Traversals; Binary Search Trees; AVL Trees;Multiway Trees: B-Tree, Simplified B-Tree; B – Tree variations; Terminology; Operations;

Graph: Storage Structures; Traversal Algorithms; Shortest Path Algorithm; Abstract Data Type.

Unit 5: Sorting 12hrs

General Sort concepts: Insertion Sorts; Selection Sorts; Exchange Sorts.

References:

Horowitz, Ellis and Sahul, Sartaj, (1983).*Fundamentals of Data Structures*, (1st ed.). Galgotia publication Pvt Ltd

Jean-Paul Tremblay & Paul G Sorenson. *An Introduction to Data Structures with Applications*, Tata McGraw-Hill Publishers

Kamthane, Ashok N. (2007).*Introduction to Data Structures in C.* Pearson Education Delhi

Mark Allen Weiss, (1999).*Data Structures and Algorithm Analysis in C.* Addison-Wesley

Nell Dale, *C++ Plus Data Structures*, Jones & Bartlett Publishers

Richard F.Gilberg, Behrouz A. Forouzan, (2002).*Data Structures: A Pseudo code Approach with C*. Thomson Asia Pvt., Ltd.

Robert L. Kruse, Bruce P. Leung, Clovis L. Tondo, (2001).*Data Structures and Program Design in C.* Prentice Hall India.
Seymour Lipschutz, *Data Structures with C.* (Special Indian Edition).Tata McGraw Hill Education Pvt. Ltd. Schaum's Outlines

13MCA2202 OBJECT ORIENTED PROGRAMMING WITH JAVA

Credits: 3 **Total: 60 Hours**

Objectives:

To understand the concept of basic syntax of java, writing simple objects in Java, Concept of inheritance, interface and packages, threading and exception handling mechanism.

Unit 1: Introduction 12hrs

Evolution of programming methodologies, procedural Approach vs Object-Oriented Approach. Principles of OOP- Encapsulation, Inheritance and Polymorphism. Concepts of OOP: Abstraction, Overloading, Reusability, Extensibility, Dynamic Binding, Message Passing.

Java Features; comparison of Java with C and C++; Java and Internet; Java Environment; Java Program structure; Java Tokens; Implementing a Java Program Java Virtual Machine; Constants, Variables; Data Types; Scope of Variables; Type casting; Operators and expressions; Decision Making; Branching and Looping.

Unit 2: Classes and Arrays 12hrs

Defining a class; Constructors; Methods; overloading; static Members; Nesting of Methods; Overriding methods; Final Classes; Abstract Class; Visibility control Arrays; creating an array; Two Dimensional arrays; Strings; String Arrays; String Methods; String Buffer Class; Vectors; Wrapper Classes.

Unit 3: Inheritance Interfaces and Packages 12hrs

Defining a subclass; Subclass constructor; multilevel inheritance; Hierarchical Inheritance; Defining Interfaces; Extending Interfaces; Implementing Interfaces; Java API Packages; creating a package; Accessing and using a package; adds a class to a package; Hiding Classes.

Unit 4: Multithreading Exception Handling and Files creating Threads 12hrs

Extending the Thread class; Thread Life cycle; Thread Exception, Thread priority, Synchronization; Runnable Interface; Exceptions, Throwing own Exceptions; Concepts of streams; stream classes; Byte Stream Classes; Character stream Classes; Using Streams; Using file Class; Other Stream Classes.

Unit 5: Applet Programming, JDBC 12hrs

Difference between Application and Applets; Applet Life cycle; creating an Executable Applet; Designing a Web Page; Adding Applet to HTML File; Passing Parameters to Applets; Event handling mechanism. Java Database Connectivity: introduction; Establishing Connection, Creation of Data Tables; Table Updating, Result set.

References:

Bruce Eckel. *Thinking in Java*, Prentice Hall
C Muthu. (2004). *Programming with Java.* Thomson Learning.
E. Balagurusamy. (2002). *Programming with Java – A primer* (2nd ed.).
Delhi: Tata McGraw Hill Publishing Company
Deitel and Deitel, *Java How to Program*. (3rded,). Pearson Education Asia.
Gary Cornell, Cay Horstmann, *Core Java 1.2.* Prentice Hall Computer Books
Herbert Schildt. (2002). *The complete Reference – Java 2*. (5th ed.). TataMcGrawHill Publishing Company, Delhi.
RashmiKanta Das. (2011). *Core Java for Beginners.* (Revised Edition).Vikas Publications

13MCA2203 PROBABILITY AND STATISTICS

Credits: 3 **Total: 60 Hours**

Objectives:

This course is designed to equip the students with a working knowledge of univariate and bivariate descriptive statistics, concepts of probability, formulation and testing of hypothesis and Calculation of the Descriptive and Inferential Statistics by MS Excel

Unit 1: Statistics & Describing Data **12hrs**

Introduction to statistics – meaning; function of statistics, concept of data, variable, measurement; Summarizing data – need & ways of summarizing data; Measures of central tendency; Averages; types, meaning, computation & uses; Measures of dispersion in data; Need, types, meaning, Measures of symmetry – concept of skewness and kurtosis, meaning & measures

Correlation & Regression and Curve Fitting;Fitting of linear quadratic, exponential curves to a given set of data by principle of least squares. Correlation; Need meaning, types and measures; lag and lead in correlations. Regression – meaning, fitting linear regression model; prediction & explanation with linear regression model, Statistical inference in regression model; test for significance of correlation coefficient, regression coefficient.

Unit 2: Probability Theory **12hrs**

Probability **–** meaning and importance, theorems on probability, conditional probability, Bayes' theorem and its applications.

Unit 3: Random variables **12hrs**

Random variable – concept, properties ; concept of probability mass, density and distribution function. Bi-variate distributions, marginal, conditional distributions for discrete and continuous variates, covariance and correlation coefficient, Independence of random variables. Addition and multiplication theorems of expectation, Central limit theorem.

Unit 4: Probability distributions **12hrs**

Standard probability distributions – Binomial, Poisson, Geometric, Exponential, Normal probability distribution; properties &applications**.**Sampling distributions and standard

error. Sampling distribution of the sample mean. Definition of Chi – square, t and F distributions.

Unit 5: Statistical Inference – Estimation & Hypothesis testing 12hrs

Data collection – primary & secondary data; overview of data collection instruments; Sampling – need, benefits types; Sampling methods – probability and non-probability sampling methods – SRS, Stratified, Cluster, Systematic Estimation of parameters – point & interval estimators for mean and proportion; Statistical Hypothesis Testing – meaning, formulation, errors in testing, level of significance and power of a test; Single population tests for mean, proportion & variance; Two population tests for mean, proportion & variance; Analysis of Variance (ANOVA) & Chi-Square test for goodness of fit and independence of attributes.

References:

Azel and Sounderpandian, (2007).*Complete Business Statistics*, (6th ed.). TMH, New Delhi

B L Aggarwal, (2007).*Basic Statistics*, (4thed.). New Age Publications, New Delhi

BR Dey,(2005).*Managerial Statistics*, (2nd ed.). McMillan, New Delhi

JK Sharma, (2010).*Business Statistics*, (2nded.). Pearson, New Delhi.

RP Hooda, (2005).*Statistics for Business and Economics*, (3rd ed.). McMillan, New Delhi

RS Bhardwaj, (2006).*Mathematics for Economics and Business*, (2nded.). Excel Books, New Delhi

S C Gupta, (2011).*Fundamentals of Statistics*, (6thed.). Himalaya Publishing House, Mumbai

Sheldon M Ross, (2010).*Introductory Statistics*, (3rd ed.). Elsevier Inc. USA

13MCA2204 LINUX SYSTEM PROGRAMMING

Credits: 3 **Total: 60 Hours**

Objectives:

To give a firm ground on Linux environment to program the real world application.

Unit 1: Introduction to Linux Operating System Environment 12hrs

Linux evolution, Main characteristics of Linux OS; Linux Distributions; General Kernel responsibilities; Kernel overview; Linux versus other UNIX like Kernels; programming Linux; GNU C compiler; GNU make; GNU Debugger; Development system roadmap; Compiling the Kernel; Kernel related commands; System related commands.

Unit 2: Shell Programming and Advance System programming 12hrs

Introduction to Shell; Shell as a programming language; Types of Shells; Shell syntax; Pipes and redirection; Environment variables; working with Files; Introduction to process; Process state transition; Creation of a new process; Termination of a process; Process scheduling; Waiting for the process; Zombie process; sharing data between processes using files; thread overview; POSIX threads; Thread implementation; Interprocess Communication; Signals; Socket Programming.

Unit 3: Kernel Module Programming **12hrs**

Creation of Static & Dynamic Libraries; Portability support in the kernel; Step by Step demystification of Linux Boot Procedure; Module Programming; The Hello World Module; Module Stacking; Module Parameters; System Calls; Registering a System Call;System Call Handler; Service Routines.

Unit 4: Kernel Synchronization **12hrs**

Critical Sections; Race Conditions; Concurrency and its Sources;Mechanisms for Kernel Synchronization;Semaphores;Reader Writer Semaphores;Spinlocks;Reader Writer Spinlocks;Completions;Sequential locks;Barriers;Read Copy Update;Atomic Operations;Memory Allocation in the kernel.

Unit 5: Interrupts and Device Drivers **12hrs**

Handling I/O;I/O Architecture;I/O Mapped I/O;Memory Mapped I/O;Interrupts & Interrupt Handlers; Device Numbers Major and Minor Numbers; Registering and Unregistering; Static and Dynamic allocations, Important Structures:File Operations,FileInode,Character Devices, cdev structure,Adding, Allocating, Initializing and Deleting,User Space Applications and Device Driver mapping,Access methods within the driver, open, read, write and close,Advanced Character Drivers,IOCTL,Wait Queues. Parallel Port Driver,Serial Port Driver,Block Drivers,USB Drivers,Network Drivers,PCI Drivers,TTY Subsystem

References:

Ashfaq A. Khan (2002).*Practical Linux Programming*. New Delhi India:Firewall Media.

Daniel P.Bovet& Marco Cesati, (2006).*Understanding Linux Kernel*(3rd ed.)O'reilly Series. (Unit I,Unit IV, Unit V)

Greg Kroah-Hartman (2006).*Linux Kernelin a Nutshell*. O'reilly Series.

Jonathan Corbet, Alessandro Rubini& Greg Kroah-Hartman (2005).*Linux Device Drivers.(* 3rd ed.) O'reilly Series (Unit V)

Michael Beck, Harald Bohme, Robert Magnus, Dirk Verwoner; (2002).*Linux Kernel Programming*(3rd ed.). Pearson Education Ltd.(Unit III)

Neil Mathew and Richard Stones (2004).*Beginning Linux Programming*(3rd ed.) Wiley Publishing, Inc. (Unit II)

Robert Love, (2010).*Linux Kernel Development*(3rd ed.*).* Pearson Education Inc.

W. Richard Stevens (2002).*UNIX Network Programming*.(11th ed.). Prentice Hall of India private ltd.

13MCA2205 RELATIONAL DATABASE MANAGEMENT SYSTEM

Credits: 3 **Total: 60 Hours**

Objectives:

To understand the database development process and technology, the Structured Query Languages (SQL), to design data models for database applications using the entity - relationship (ER) diagrams (conceptual design), to understand the database security, to understand the architecture of distributed database.

Unit 1: Introduction **12hrs**

Basic Concepts and definitions; traditional file processing systems; disadvantages of file processing systems; the database approach; advantages of database approach; DBMS; components of the database environment,; Schemas and instances; Three-schema architecture and data independence; users of the database system; DBA; functions of DBA, database applications; centralized and client-server architectures

Unit 2: Data Models **12hrs**

Classifications of data models, ER Model**;** Entities, attributes and relationships, different types of attributes, Drawing E-R diagrams. EER Diagrams - Super class and Subclass, Specialization and Generalization. Relational Data Model - Relation, Integrity constraints-domain, entity and referential integrity constraints, Relational algebra, select, project and join operations in relational algebra. Introduction to Object Oriented Data Model and Object Oriented Databases

Unit 3: Database Design **12hrs**

Functional Dependencies –Database Design Concepts; Good and Bad Database Design; Lossless – Join Decomposition; Dependency Preservation – Normalization using Functional Dependency; Multi-valued Dependency and Join-Value Dependency; Designing a database schema for an application

Unit 4: SQL **12hrs**

SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic queries in SQL; Complex SQL Queries; Nested and Correlated Queries; Insert; Delete and Update statements in SQL; Views in SQL; UPDATE and DELETE CASCADE commands, PL SQL – Triggers and Procedures - Simple Exercises

Unit 5: Data Administration and Security **12hrs**

Transaction Processing - Transaction and System concepts, Characterizing Schedules, Concurrency control techniques; Two Phase locking; Database Recovery Concepts; Recovery Techniques. Distributed databases -Introduction, Distributed database architecture; Types of database partitioning; advantages and disadvantages.

References:

Abraham Silberschatz, Henry F Korth and Sudarshan S,*Database System Concepts,* (5^{th} ed.). McGraw Hill Publication.

Bipin C Desai, (2000).*An Introduction to Database Systems.* Galgotia Publications

Date C.J. (2000).*Introduction to Database System.* (7^{th} ed.). Addison-Wesley Publications

Elmasri and Navathe. (2006).*Fundamentals of Database System.* (4^{th} ed.). Addison Wesley, Pearson Education.

Jeffry A Hoffer, Ramesh V and HeikkiTopi. (2011). *Modern Database management System*, (10^{th}ed.). Pearson.

Patrik O' Neil and Elizabeth O' Neil, (2001).*Database Principles, Programming and performance.* (2^{nd}ed.). Morgan Kaufmann Publishers.

Peter Rob and Carlos Coronel, (2007). *Database System Design, Implementation and Management.* (7^{th}ed.). Thomson Course Technology.

13MCA22L1 DATA STRUCTURES LAB

Write C programs for the following:

Section - A

1. Write a menu driven program to implement linear and binary search to find the location of first occurrence of an item.
2. Write a menu driven program to sort the array in ascending/descending order using
   a) Quick sortb) Merge sort
3. Write a menu driven recursive program to

a. Find factorial of a given number

b. generate first N terms of a Fibonacci sequence

c. GCD of three numbers

4. Write a program to solve the problem of Towers of Hanoi with 3 pegs and N discs.
5. Write a menu driven program to
   a) Find the length of a string
   b) Concatenate twostrings
   c) To extract a substring from a given string
   d) Finding and replacing a string by another string in a text(Use pointers and user-defined Functions)
6. Write a program to convert the given infix expression into its postfix form.
7. Write a program to evaluate the postfix expression with a set of values.
8. Write a program to sort N elements in ascending order using heap sort technique.
9. Write a program to obtain the path matrix of the given graph.

Section – B

1. Write a menu driven program to create a linked list and to perform insert and delete operations.
2. Write a program to add two polynomials using a linked list.
3. Write a menu driven program to perform insert and delete operations in a circular linked list.
4. Write a menu driven program to perform operations on a stack(linked list implementation)
5. Write a program which demonstrates Round Robin process scheduling technique for n processes. The CPU burst time and time slice allotted for each process by CPU has to be taken as input. The program should give as output the response time for each process.
6. Write a menu driven program to perform operations on a circular queue (linked list implementation)
7. Write a menu driven program to perform insert, delete and traversal operations in a doubly linked list.
8. Write a menu driven program to create a binary tree and to perform insert and delete operations.
9. Write a menu driven program which implements insertion of a node and deletion of the root node in a complete binary tree.
10. Write a menu driven program to create a binary search tree and to perform in order, preorder and post order traversals.

13MCA22L2 JAVA PROGRAMMING LAB

1. Write a program to convert a given Decimal number to Binary, Octal and Hexadecimal using recursive functions.
2. Write a program to explain the concept of constructor overloading.
3. Explain the concept of passing objects as parameters by adding two distances given in feet and inches.
4. Write a program to explain the concept of runtime polymorphism in java.
5. Write a program to implement producer consumer problem using thread concept.
6. Write a program to create object for Tree Set and Stack and use all methods.
7. Write a program to interchange the content of two files.
8. Write a program to copy a file to another file using java.io package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.
9. Write a program to get file name at runtime and display number of lines and words in that file.
10. Write a program to list files in the current working directory depending upon a given pattern.
11. Create a Frame for Student Registration containing all the fields Name, Age, Contact, Father's Name, Annual Income and a submit button. Perform field validations.
12. Write a program to display a stopwatch with two command buttons for calculating and displaying the lap time and split time.
13. Write a applet program to create a calculator
14. Write a program to perform the following operation using JDBC
    Insert, Update, Delete and Select Data

13MCA3201 WEB TECHNOLOGIES

Credits: 3 **Total: 60 Hours**

Objectives:

- To inculcate basic knowledge on Internet concepts, client and server-side programming and to employ it in creating dynamic and interactive web pages. This subject deals with basics of Internet, concepts of DHTML, Java Scripting and Server Side programming

Unit1: Basics of Internet **12hrs**

The Internet; WWW; Domain Names and Addresses;Web Hosting; DNS; Web publishing;Web Browsers & Web Servers; Web Pages; Web sites;Concept of Search Engines; Search engines types; searching the Web and Web Servers;URL; MIME; HTTP;Electronic mail; ftp; telnet; finger.

Unit2: DHTML **12hrs**

Introduction to Dynamic HTML, Form Controls – Text Controls, <INPUT> tag, Button Element and Other Form Attributes; Adding Intelligence to Clients Display; Adding Depth and Texture; Cascading Style Sheets (CSS); Parents and Children; Selectors and Classes; Animation; Moving Elements – Determining Position and Positioning at Run-time; DHTML and Multimedia; Incorporating Images and Sound in Web Pages.

Unit3: Java Script and DOM **12hrs**

Java Script's role on the Web, Java Script and HTML – The <SCRIPT> tag; Variables, Arrays; Data Types and Operators; Control Structures – if, else if, switch, while loop, do... While loop, for loop, for... in loop, With, Continue; Functions; Java Script Objects; Windows and Frames; Window Object and its Methods; Document Object and its methods; Java Script Object Model; Java Script Events and Event Handling; Frames and frame formatting; Image Object.

Unit4: HTTP Server Programming **12hrs**

HTML forms and CGI; HTTP;Servlet Programming**;** The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; deployment of simple servlets, web server (Java web server / Tomcat/ Web logic) The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses, HTTP GET and POST methods, Using Cookies; Session Tracking

Unit5: JSP and XML **12hrs**

Java Server Pages (JSP); JSP, **JSP** life cycle, Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects; XML – Tags, Elements, Attributes, XML with CSS, XML and DTD (Document Type Definition), XML Schema.

References:

Achyut S. Godbole (2004). *Web Technologies*. Tata McGraw Hill.

David Flanagan (1997). *JavaScript the Definitive Guide.* O'Reilly & Associates

Don Gosselin. *Comprehensive Java Script, Web Warrior Series.* Course Technologies Inc.

Herbert Schildt. *The Complete Reference Java*. (7th ed.). New Delhi: Tata McGraw-Hill Publishing Company Limited.
H.M. Deitel, P.J. Deitel, and T.R. Nieto, (2000*). Internet and World Wide Web, How to Program.* Cambridge Prentice Hall.
Jim Koegh (2004). *The J2EE: Complete Reference.* Tata McGraw Hill.
J. Niederst, (1999). *Web Design in a Nutshell.* O'Reilly – Associates.
MadhushreeGanguli (2002). *JSP – A Beginner's Guide.* Wiley Dreamtech India (P) Ltd.
Marty Hall, (2003). *The Core Web Programming.* Prentice-Hall.
Michele Petrovsky, *Dynamic HTML in Action.* Tata McGraw-Hill Publications.
Phil Hanna, *JSP 2.0. The Complete Reference.* Tata McGraw-Hill Publications.
Robert W. Sebesta (2006). *Programming the World Wide Web*. (3rded.). Pearson education.

13MCA3202 ACCOUNTING AND FINANCIAL MANAGEMENT

Credits: 3 **Total:60 Hours**

Objectives:

To introduce and gain thorough knowledge about the concepts of accounting and financial management system.

Unit1: **15hrs**

Accounting; Principles, concepts and conventions, double entry system of accounting, Introduction to basic books of accounts of sole proprietary concern, closing of books of accounts and preparation of trial balance. Final Accounts; Trading, Profit and Loss accounts and Balance Sheet of sole proprietary concern (Without adjustments).

Unit2: **15hrs**

Financial Management; Meaning, scope and role, a brief study of functional areas of financial management.Introduction to Various FM Tools; Ratio Analysis, Fund flow statement & Cash flow statement. Introduction to Cost Accounting; Nature, Importance & Basic Principles, Brief Introduction to methods of Costing & Elements of Cost, Unit Costing.

Unit 3: **15hrs**

Computerized Accounting; Meaning & advantages, limitations of computerized accounting, manual accounting verses computerized accounting, Source documents, Balancing Accounts, Trial Balance & Final A/Cs in computerized, Accounting, Modules of computerized Accounting Systems. Developing computerized accounting systems, control & Audit in computerized accounting.

Unit 4: **15hrs**

Business Systems, Production Control System, Inventory System, Payroll System

References:

Armolel, (2003). *Financial Accounting.* PHI (Paperback editor).
Bassett P.H, (2003). *Computerized Accounting*, BPB.

Charlotte EudyMcConn, (2004). *Business Computer Systems: Design, Programming &Maintenance. (*PHI).
Horngren and Sundem(2004). *Introduction to Financial Accounting.* PHI.
Jain and Narang, (2003). *Principles of Accounting.*
Jain and Narang, (2004). *Cost Accounting*.
Kellock. J, (2003).*Elements of Accounting.* Heinemann.
Kulkarni P.V, (2003). *Financial Management*, Himalaya Publishing House.
Levy and sarnat,(2004). *Principles of Financial Management.* Prentice–Hall International.
Neeraj Sharma, (2004). *Computerized Accounting & Business Systems.*Kalyani Publishers.
Pandey I.M, (2003). *Financial Management.*Vikas Publications.
Rockely.L.E, (2003). *Finance for the Non-accountant*, (2nd ed.).
Ramachandran, (2003). *Financial Accounting for Managers.* Tata McGraw Hill.
Sharma, Gupta &Bhalla, (2004). *Management Accounting.*
Var Home, James C, (2003). *Financial Management & Policy.* Prentice Inc.

13MCA3203 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 3 **Total: 60 Hours**

Objectives:

To introduce the basic concepts of algorithms, the mathematical aspects and analysis of algorithms, the sorting and searching algorithms, various algorithmic techniques and also the algorithm design methods

Unit 1: BASIC CONCEPTS OF ALGORITHMS 12hrs

Introduction; Notion of Algorithm, Fundamentals of Algorithmic Solving; Important Problem types; Fundamentals of the Analysis Framework; Asymptotic Notations and Basic Efficiency Classes.

Unit 2: MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHM 12hrs

Mathematical Analysis of Non-recursive Algorithm; Mathematical Analysis of Recursive Algorithm; Example: Fibonacci Numbers; Empirical Analysis of Algorithms; Algorithm Visualization.

Unit3: ANALYSIS OF SORTING AND SEARCHING 12hrs

Brute Force; Selection Sort and Bubble Sort; Sequential Search and Brute-force string matching; Divide and conquer; Merge sort; Quick Sort; Binary Search; Binary tree; Traversal and Related Properties;Strassen's Matrix Multiplication; Decrease and Conquer; Insertion Sort; Depth first Search and Breadth First Search.

Unit 4: ALGORITHMIC TECHNIQUES 12hrs

Transform and conquer; Presorting; Horner's rule and Binary exponentiation; Dynamic Programming;Warshall's and Floyd's Algorithm; Optimal Binary Search trees; Knapsack Problem and memory functions; Greedy Techniques; Prim's Algorithm;Kruskal's Algorithm; Dijkstra's Algorithm; Huffman trees.

Unit 5: ALGORITHM DESIGN METHODS **12hrs**

Backtracking; n-Queen's Problem; Hamiltonian Circuit problem; Subset-Sum problem; Branch and bound; Assignment problem; Knapsack problem; Traveling salesman problem; Limitations of Algorithmic Power; Lower bound arguments; NP and NP complete problems.

References:

Aho A.V, J.E. Hopcroft and J.D.Ullman, (2003). *The Design and Analysis of Computer Algorithms.* Pearson Education Asia.

AnanyLevitin,(2003). *Introduction to the Design and Analysis of Algorithm*, Pearson Education Asia.

Cormen T.H, C.E. Leiserson, R.L. Rivest and C. Stein, (2001). *Introduction to Algorithms.* PHI Pvt. Ltd.

Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, (1997). *Computer Algorithms*. Galgotia Publications.

Michael T.GoodRich, Roberto Tamassia, *Algorithm Design, foundations, Analysis and internal examples.* ISBN 978-81-265-0986-7

Sara Baase and Allen Van Gelder, (2003). *Computer Algorithms - Introduction to Design and Analysis.* Pearson Education Asia.

Thomas H.Lorman, Charles, Ronald, *An Introduction to Algorithms.* IEEE Pub. 978-81-272-5464-3.

13MCA3204 SOFTWARE ENGINEERING

Credits: 3 **Total: 60 Hours**

Objectives:

- To provide an insight into the processes of software development.
- To understand and practice the various fields such as analysis, design, development, and testing.
- To apply metrics and testing techniques to evaluate the software.

Unit 1: INTRODUCTION **12hrs**

Software Engineering paradigms- Waterfall Life cycle model, Spiral Model, Prototype Model,Fourth Generation Techniques – Planning, Software Project Scheduling, Risk analysis and management; Requirements and Specification; Case Study for Project Plan and SRS.

Unit 2: SOFTWARE DESIGN **12hrs**

Abstraction, Modularity; Software Architecture; Cohesion; Coupling; Various Design Concepts and notations; Real time and Distributed System Design; Documentation; Dataflow Orienteddesign; Jackson System development; Designing for reuse; Programming standards; Case Study for Design of any Application Project.

Unit 3: SOFTWARE TESTING AND MAINTENANCE **12hrs**

Software Testing Fundamentals; Software testing strategies; Black Box Testing; White Box; Testing – System Testing, Object Orientation Testing, and State based Testing; Testing Tools – Test Case Management, Software Maintenance Organization-Maintenance Report; Types ofMaintenance, Case Study for Testing Techniques, Software Quality Management.

Unit 4: SOFTWARE METRICS 12hrs

Scope – Classification of metrics; Measuring Process and Product attributes; Direct and Indirectmeasures; Cost Estimation; Reliability; Software Quality Assurance; Standards; Case Study for COCOMO model.

Unit 5: SCM & WEB ENGINEERING 12hrs

Need for SCM – Version Control; SCM process; Software Configuration Items; Taxonomy; CASE Repository; Features;Secure Coding; Deployment Activities, Web Engineering and Agile development.

References:

Ali Behforroz, Frederick J.Hudson, (2012).*Software Engineering Fundamentals*, Oxford Indian Reprint.

Jibitesh Mishra, Ashok Mohanty, (2012). *Software Engineering*, Pearson Education, First Edition.

Kassem A. Saleh, (2009). *Software Engineering*, First Edition, J.Ross Publishing.

PankajJalote, (2005). *An Integrated approach to Software Engineering*, Third Edition, Springer Verlag.

Richard Fairley, (2008).*Software Engineering Concepts*, Tata McGraw Hill Edition.

Roger S. Pressman, (2010).*Software Engineering: A Practitioner Approach*, Seventh edition,McGrawHill. Roger S. Pressman, David Lowe, (2008). *Web Engineering: A Practitioner's Approach*, Special Indian edition, McGrawHill.

Sommerville, (2004). *Software Engineering*, Sixth Edition, Addison Wesley-Longman.

13MCA3A01 SYSTEM SOFTWARE

Credits: 3 Total: 60 Hours

Objectives:

- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of macro processors.
- To have an understanding of system software tools.

Unit 1: INTRODUCTION 12hrs

System software and machine architecture; The Simplified Instructional Computer (SIC) Machinearchitecture; Data and instruction formats; addressing modes; instruction sets; I/O and programming.

Unit 2: ASSEMBLERS 12hrs

Basic assembler functions; A simple SIC assembler; Assembler algorithm and data structures;Machine dependent assembler features; Instruction formats and addressing modes; Program relocation;Machine independent assembler features; Literals; Symbol; Defining statements; expressions; one pass Assemblers and Multi pass Assemblers; Implementation examples- MASAM Assembler.

Unit 3: LOADERS AND LINKERS 12hrs

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

Unit 4: MACRO PROCESSORS 12hrs

Basic macro processor functions; Macro Definition and Expansion; Macro Processor Algorithm and data structures; Machine-independent macro processor features; Concatenation of Macro Parameters; Generation of Unique Labels; Conditional Macro Expansion; Keyword Macro Parameters; Macro within Macro; Implementation example - MASM Macro Processor; ANSI C Macro language.

Unit 5:SYSTEM SOFTWARE TOOLS 12hrs

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

References:

John J. Donovan (2000). *Systems Programming*. Tata McGraw-Hill Edition.
Dhamdhere D.M (2000). *Systems Programming and Operating Systems* (2nd ed.). Tata McGraw-Hill.
John R. Levine (2000). *Linkers & Loaders.* Harcourt India Pvt. Ltd.
Leland L. Beck.(2006). *System Software An Introduction to Systems Programming* (3rd ed.). Pearson Education Asia.

13MCA3B01 COMPUTER BASED OPTIMIZATION TECHNIQUES

Credits: 3 Total: 60 Hours

Objectives:

This course is concerned with developing the capability of scientifically deciding how best to design and operate man- machine systems that usually require the allocation of scarce resources and to arrive at optimal decisions with a structured and critical approach to problem solving.

Unit 1: Linear Programming 12hrs

Definition of OR; Model in OR; Principle of modeling; Introduction to Linear and non-linear programming and Formulation; Linear Programming ; Characteristics, Assumptions and Applications, Graphical Solution of two variables LPP, LP in standard

form, Solution of LP by Simplex methods, cases of LP, Duality and Dual Simplex method, Sensitivity analysis of LPP.

Unit 2: Special types of LPP's:-Transportation, Assignment, 12hrs

Nature and scope of transportation and allocation models; Methods of allocation, different methods for finding initial solution – VAM, N-W Corner Rule; and other methods; degeneracy; Finding optimal solution; Tests for optimality; Imbalance in total availability and total allocation; impossible shipments; Alternate methods of solutions, and maximization as objective Scope of transportation models;assignment problems**;** Travelling salesman problem; Row Minimum; Column Minimum; Iteration; Balanced; Unbalanced; Infeasible; Maximization.

Unit 3: Network Models 12hrs

Definition, Minimum Spanning Tree algorithm; Shortest Route problem; Maximum flow problem; CPM & PERT: Network representation; Critical Path Computations; Linear Programming formulation of CPM; PERT Networks.

Unit 4: Queuing System 12hrs

Elements of Queuing model; pure birth and death models; Generalized Poisson Queuing model; specialized Poisson; Queues: Steady-state Measure of performance, single server models, multiple server models, matching serving model.

Unit 5: Simulation 12hrs

Introduction to basic concepts, Simulation procedures, Application of simulation, critical evaluation of software and using customized software.

REFERENCE BOOKS:

Barry Render, Ralph Stair and Michael Hanna, (2007).*Quantitative Analysis.(*7th ed.). New Delhi: Pearson.

Chawla K., Vijay Gupta, Bhushan. K Sharma, Nikhil Gupta, (2008). Q*uantitative Methods and Operations Research. (* 2nd ed.). New Delhi:Kalyani publications.

Kalavathy S, (2010).*Operations research with C programming(*3rd ed.).Vikas Publishing House, Delhi

Sharma J K,(2013).*Quantitative Techniques.* (5nded.). McMillan New Delhi

Taha H.A, (2006) *Operations Research. (*5th ed.). New Delhi PHI.

Vohra ND, (2007).*Quantitative Techniques in Management(*3rd ed.). TMH New Delhi

13MCA3C01 COMPUTER GRAPHICS AND VISUALIZATION

Credits: 3 Total: 60 Hours

Objectives:

To expose the graphics concepts and its implementation through OpenGL.

Unit 1: Graphics Systems and Models 12hrs

Applications of Computer Graphics, Display of Information, Design, Simulation, User Interfaces, A Graphics System, Pixels and the Frame Buffer, Output Devices, Input Devices, Images: Physical and Synthetic Objects and Viewers, Light and Images, Ray Tracing, The Human Visual System, The Pinhole Camera, The Synthetic-Camera Model,

The Programmer's Interface, Application Programmer's Interfaces, The Pen-Plotter Model, Three-dimensional APIs, A Sequence of mages, The Modeling and Rendering Paradigm, Graphics Architectures, Display Processors, Pipeline Architectures, Transformations, Clipping, Projection, Rasterization, Performance Characteristics.

Unit 2: Graphics Programming 12hrs

The Sierpinski, Gasket, Programming Two-dimensional Applications, Coordinate Systems, The OpenGL API, Graphics Functions, The Graphics Pipeline and State Machines, The OpenGL Interface, Primitives and Attributes, Polygon Basics, Polygon Types in OpenGL, Drawing a Sphere Text, Curved Objects, Attributes, Color, RGB Color, Indexed Color, Setting of Color Attributes, Viewing, Two-Dimensional Viewing, The Orthographic View, Matrix Modes. Control Functions, Interaction with the Window System, Aspect Ratio and View ports, The main, display, and myinit Functions, Program Structure. The Gasket Program, polygons and recursion, the Three-Dimensional Gasket, use of Three-Dimensional Points, Use of Polygons in Three Dimensions, Hidden-Surface Removal.

Unit 3: Input and Interaction 12hrs

Interaction, Input Devices, Physical Input Devices, Logical Devices, Measure and Trigger, Input Modes, Clients and Servers, Display Lists, Definition and Execution of Display Lists, Text and Display Lists, Fonts in GLUT, Programming Event-Driven Input, Using the Pointing Device, Window Events, Keyboard Events, The Display and Idle Callbacks, Window Management, Menus, Picking, Picking and Selection Mode, A Simple Paint Program, Animating Interactive Programs, The Rotating Square, Double Buffering, Other Buffering Problems, Design of Interactive Programs, Toolkits, Widgets, and the Frame Buffer, Logic Operations, Drawing Erasable Lines, XOR and Color, Cursors and Overlay Planes.

Unit 4: Geometric Objects and Transformations 12hrs

Scalars, Points, and Vectors, The Geometric View, Coordinate-free Geometry, The Mathematical View: Vector and Affine Spaces, The Computer-Science View, Geometric ADTs. Lines, Affine Sums, Convexity, Dot and Cross Products, Planes, Three-Dimensional Primitives, Coordinate Systems and Frames, Representations and N-tuples, Changes of Coordinate Systems, Example of Change of Representation, Homogeneous Coordinates, Example of Change in Frames, Working with Representations, Frames and ADTs, Frames in OpenGL, Modeling a Colored Cube, Modeling of a Cube, Inward- and Outward-Pointing Faces, Data Structures for Object Representation, The Color Cube, Bilinear Interpolation, Vertex Arrays, Affine Transformations, Rotation, Translation and calling, Translation Rotation, Scaling, Transformations in Homogeneous Coordinates, Translation, Scaling, Rotation, Shear, Concatenation of Transformations, Rotation About a Fixed Point, General Rotation, The Instance Transformation, Rotation About an Arbitrary Axis, OpenGL Transformation Matrices, The Current Transformation Matrix, Rotation, Translation, and Scaling, Rotation About a Fixed Point in OpenGL, Order of Transformations, Spinning of the Cube, Loading, Pushing, and Popping Matrices, Interfaces to Three-Dimensional Applications, Using Areas of the Screen, A Virtual Trackball, Smooth Rotations, Incremental Rotation.

Unit 5: Viewing 12hrs

Classical and Computer Viewing, Classical Viewing, Orthographic Projections, Axonometric Projections, Oblique Projections, Perspective Viewing, Viewing with a Computer, Positioning of the Camera, Positioning of the Camera Frame, Two Viewing APIs, The Look-At Function, Other Viewing APIs, Simple Projections, Perspective Projections, Orthogonal Projections, Projections in OpenGL, Perspective in OpenGL, Parallel Viewing in OpenGL, Hidden-Surface Removal, Culling, Walking Through a Scene, Parallel-Projection Matrices, Projection Normalization, Orthogonal-Projection Matrices, Oblique Projections, Perspective-Projection Matrices, Perspective Normalization, OpenGL Perspective Transformations, Projections and Shadows.

References:

David F Rogers, J Alan Adams. *Mathematical Elements for Computer Graphics.* Tata McGraw-Hill Publishers

Donald Hearn, M. Baker,(2003). *Computer Graphics with OpenGL.* (3rd ed..) 131202383 (Hardback), 880 pages Pearson Education.

Edward Angel. (2002).*Interactive Computer Graphics: A Top-Down Approach Using OpenGL.* (3rd ed.). Published by Pearson Education.

Francis S. Hill, Jr., (2003). *Computer Graphics Using Open GL.*(2nd ed.). ISBN:0-02-354856-8 Publisher:PrenticeHall.

William M Newman & Robert F Sproull,*Principles of Interactive Computer Graphics.* Tata McGraw-Hill Publishers

Zhigang Xiang & Roy A Plastock,*Computer Graphics.* Tata McGraw-Hill Publishers Shaum's Outline Series

13MCA32L1 WEB PROGRAMMING LAB

1. Write a Java Servlet program to display Cookie ID
2. Write a Servlet program Reading form data using get and post methods
3. Write a Servlet program for HTTP status
4. Write a Servlet program for Error Handling
5. Write a program in Java using Servlets
    - To invoke servlets from HTML forms
    - To invoke servlets from Applets
6. Write a JSP program to perform basic Arithmetic functions
7. Write a JSP program for handling cookies
8. Write a JSP program for sending Email
9. Write a JSP program Client Request
10. Write a program in Java to create three-tier applications using JSP and Databases
    - Conducting on-line examination
    - Displaying student mark list. Assume that student information is available in database which has been stored in a database server.

13MCA32P1 SOFTWARE ENGINEERING MINI PROJECT

The students are supposed to develop a mini project for the above mentioned lab. The students can do the project in a group (team) consisting of not more than 2 students. The entire project to be submitted by each team should be done with some DBMS backend like Oracle and front end tools like VB.Net, ASP.Net, etc.

13MCA4201 MIDDLEWARE TECHNOLOGIES

Credits: 3 **Total: 60 Hours**

Objectives:
To understand the concept of basic software architecture, working of components, concept of Threading model, CORBA technologies, COM and .NET technologies.

Unit 1: Introduction **12hrs**
Software architecture; components; objects; fundamental properties of component technology; modules;interfaces;callbacks; directory services; component architecture; components and middleware.

Unit 2: Java Component Technologies **12hrs**
Threads; Java Beans; events and connections; properties; introspection; JAR file; reflection; object serialization; Enterprise Java Beans; Distributed Object Models; RMI and RMI-IIOP.

Unit 3: CORBA Technologies **12hrs**
Java and CORBA; Interface Definition language; Object Request Broker; System Object Model; Portable Object Adapter; CORBA services; CORBA component model; Containers; Application server; model driven architecture.

Unit 4: COM and .Net Technologies **12hrs**
COM, Distributed COM; object reuse; interfaces and versioning; dispatch interfaces; connectable objects; OLE containers and servers; Active X controls; .NET components;assemblies;appdomains; contexts; reflection; remoting.

Unit 5: Component Frameworks and Development **12hrs**
Connectors; contexts;EJB containers; CLR contexts and channels; black box component framework; directory objects; cross-development environment; component-oriented programming; Component design and implementation tools; testing tools; assembly tools.

References:
Alan Gordon, *The COM and COM+ Programming Primer.* Object Innovations
Andreas Vogel, Keith Duddy, (1998). *Java Programming with CORBA.* John Wiley & Sons
Ash Rofail, Yasser Shohoud, (1999).*Mastering COM and COM+*. SybexInc
Clemens Szyperski, (2002).*Component Software: Beyond Object-Oriented* Corry, Mayfield, Cadman, (1999), *COM/DCOM Primer Plus*.(1st ed.). Tec media*Programming.* (2nd ed.). Addison Wesley.
Ed Roman, (2004). *Enterprise Java Beans.* (3rd ed.). Wiley.
Jose Mojica, *COM+ Programming with Visual Basic.* O'Reilly MediaInc

13MCA4202 DATA COMMUNICATION AND NETWORKS

Credits: 3 **Total: 60 Hours**

Objectives:

To become familiar with layered communication architectures (OSI and TCP/IP), to understand the concepts of reliable data transfer, to know the principles of routing algorithms and congestion control and trade-offs in fairness and efficiency, to understand the concepts of protocols in different layers of network.

Unit 1: Data Communications **12hrs**

Basic components of Networks, Direction of data flow, types of connections - point to point and multipoint – networks; topologies; protocols and standards; ISO/OSI model; TCP/IP model; Transmission media - coaxial cable; fiber optics; line coding; Modems; RS232 interfacing sequences.

Unit2: Data Link Layer **12hrs**

Error; detection and correction; parity; LRC;CRC; hamming code; flow control and error control; Stop and Wait; Go Back-N ARQ; Selective Repeat ARQ; sliding window; HDLC; LAN; Ethernet; IEEE 802.3; IEEE 802.4; IEEE 802.5; IEEE 802.11;FDDI; bridges.

Unit 3: Network Layer **12hrs**

Internetworks; packet switching and datagram approach; IP addressing methods; subnetting; routing- distance vector routing and link state routing; routers.

Unit 4: Transport Layer **12hrs**

Duties of transport layer; multiplexing; De- multiplexing; sockets; user data gram protocol (UDP); transmission control protocol (TCP); congestion control; quality of services (QOS); integrated services.

Unit 5: Application Layer **12hrs**

Domain name space (DNS); SMTP; FTP; HTTP; WWW; Security; Cryptography.

References:

Andrew S. Tanenbaum, (2012), *Computer Networks*. (5th ed.), Pearson Education

James F.Kurose and Keith W Ross, (2005), *"Computer Networking: A top-down Approach featuring the Internet"*, (3rd ed.), Pearson Education.

Larry L Paterson and Peter Davie, (2004), *"Data Communication and Networking",* Tata McGraw Hill.

William Stallings, (2007), "Data and Computer Communication", (6th ed.), Pearson education.

13MCA4203 OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

Credits: 3 **Total: 60 Hours**

Objectives:
To provide the knowledge and skills required to use UML notation, the industry standard for documenting and communicating the analysis and design of an object-oriented project.

Unit 1: Introduction to UML **12hrs**
Importance of modeling; principles of modeling; Object oriented modeling; conceptual model of the UML; Architecture; and Software Development life cycle.

Unit 2: Basic Structural Modelling **12hrs**
Classes, Relationships; Common mechanisms; and diagrams;Advanced structural modeling; advanced classes; advanced relationships; Interfaces; Types and Roles; Packages; class and object diagrams: Terms; concepts;modelling techniques; for class and Object diagrams.

Unit 3: Basic BehavioralModelling-I **12hrs**
Interactions; Interaction diagrams; Basic behavioural;Modelling-II; Use cases; Use case Diagrams; Activity Diagrams.

Unit 4: Advanced BehaviouralModelling **12hrs**
Events and signals; state machines; processes and Threads; time and space; state chart diagrams, Behavior Driven Development – Principles, Specialized tooling support, story versus specification.

Unit 5: Architectural modelling **12hrs**
Component Deployment; Component diagrams and Deployment diagrams; Case study: The Unified Library Application

References:

AtulKahate, *Object Oriented Analysis and Design.* The McGraw-Hill Companies

Craig Larman, *Applying UM and Patterns: An Introduction to Object –Oriented Analysis and Design and Unified Process.* Pearson Education

Grady Booch, James Rumbaugh, Ivan Jacobson: *The Unified Modelling Language User Guide*. Pearson Education.

Hans-Erik, Magnus Penkar, Brian Lyons, David Fado, *UML 2 Toolkit.* WILEY-Dreamtech India Pvt Ltd.

Mark Priestley, *Practical Object-Oriented Design with UML*. TATA McGrawHill

Meiler Page –Jones, *Fundamentals of Object Oriented Design in UML.* Pearson Education

Pascal Roques, *Modelling Software Systems using UML2*. WILEY- Dreamtech India Pvt Ltd.

13MCA4A01 THEORY OF COMPUTATION

Credits: 3 **Total: 60 Hours**

Objectives:

It deals with all aspects of theoretical computer science, namely automata, formal languages, Computability and complexity

Unit 1: Review of Mathematical Preliminaries: 12hrs

Set, Strings, Alphabet andLanguages

Unit 2: Finite Automata 12hrs

Deterministic Finite Automata, Non Deterministic Finite Automata, Equivalence of NFA and DFA with proof, Automaton with E-moves, FSM with output (Moore and Mealy machine), Examples of lexical analyser, two way automaton. Regular Expressions and their equivalence to finite automata.

Unit 3: Regular Expressions and languages 12hrs

Regular Expressions and their equivalence to finite automata, Regular Sets and their properties, Pumping lemma for regular sets, Decision algorithms, Minimization automata, Minimization algorithm.

Unit 4: Context Free Grammar 12hrs

Grammars and their type, Context Free Grammars, Derivation Trees, Simplification of context Free Grammars, Normal form of Chomsky and Griebach**.**

Unit 5: Push down Automata & Turing Machines 12hrs

Push down Automata and Context Free Languages, Equivalence of PDAs and CFLs, Turing Machines, Properties if recursive and recursively languages, Greibach Theorem, Recursive function theory**.**

References:

Daniel I.A. Cohen, "Introduction to Computer Theory", Wiley, Second edition Hopcroft

Lewis H.R and C.H. Papa dimitriou, “Elements of the theory of Computation”, Pearson Education Asia 2nd Edition.

LewishPapadimutrau “Theory of Computation” , Prentice Hall of India, New Delhi.

Mishra &ChanderShekhar “Theory of Computer Science (Automate, Language & Computations), PHI.

Moret B.M, “The Theory of Computation”, Pearson Education Asia.

Motwani R and J.D. Ullamn, “Introduction to Automata Theory, anguages and Computation”, Pearson Education Asia, 2nd Edition.

Peter linz, “An Introduction to formal language and automata”, Third edition, Narosa publication**.**

13MCA4B01 E-COMMERCE and M-COMMERCE

Credits: 3 **Total:60 Hours**

Objectives:

To obtain knowledge of Internet hardware associated with E-commerce systems, to gain knowledge of selected Standard application commonly used in business, to design a fundamental E-Business concept, to gain knowledge of the issues of network security and business-tech protocols, and to Introduction to Mobile commerce, framework and M-Com models.

Unit1: 12hrs

Electronic Commerce Framework, Electronic Commerce and Media Convergence, The anatomy of E-Commerce Applications, Electronic Commerce Consumer Applications, Electronic Commerce Organization Applications. Market forces influencing the I-Way, Components of the I-Way, Network Access Equipment, The Last Mile: Local Roads and Access Ramps, Global Information Distribution Networks, Public Policy issues shaping the I Way.

Unit 2: 12hrs

Architectural Framework for Electronic Commerce, World Wide Web (WWW) as the Architecture, Web Background: Hypertext Publishing, Technology behind the Web Security and the Web, Consumer-Oriented Applications, Mercantile models forms the Consumer's perspective, mercantile models from the merchant's perspective.

Unit 3: 12hrs

Types of Electronic Payment systems, Digital token based electronic payment systems, Smart Cards and Electronic Payment Systems, Credit card based electronic Payment Systems, Risk and Electronic Payment Systems, Risk and Electronic Payment Systems, Designing Electronic Payment Systems. Electronic Data Interchange, EDI Applications in business, EDI: Legal, Security and Privacy issues, EDI and electronic Commerce.

Unit 4: 12hrs

Introduction, Infrastructure of M–Commerce, Types Of Mobile Commerce Services, Technologies Of Wireless Business, Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M–Commerce, Wireless/Wired Commerce Comparisons.

Unit 5: 12hrs

A Framework for the study of Mobile Commerce, NTT DoCoMo's I-Mode, Wireless Devices For Mobile Commerce, Towards A Classification Framework For Mobile Location Based Services, Wireless Personal And Local Area Networks, The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

References:

Brian Mennecke.E, J. Troy Strader, (2003). *Mobile Commerce: Technology, Theory and Applications.* Idea Group Inc., IRM press.

JefferyF.Rayport, Bernard J.Jaworski, (2002). *E-Commerce.* Tata McGraw Hill Publications

Joseph.P.J, (2003). *E-commerce – A Managerial Perspective.* Prentice Hall

Louis.P.J, (2001). *M-Commerce Crash Course.* McGraw- Hill Companies February.

Paul May, (2001). *Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business. C*ambridge University Press.
Ravi Kalakota, Andrew Winston, (2003). *Frontiers of Electronic Commerce.* Pearson Education.

13MCA4C01 XML AND WEB SERVICES

Credits: 3 **Total: 60 Hours**

Objectives:
To study the basics of XML, web services and concepts and to enable the students to develop their creativity in the web services.

Unit 1: Introduction 12hrs
Role of XML; XML and the Web-XML language basics;SOAP;Web Services; Revolutions of XML;Service Oriented Architecture (SOA).

Unit 2: XML Technology 12hrs
XML;Name spaces;Structuring with schemas and DTD;Presentation Techniques; Transformation;XML infrastructure.

Unit 3: SOAP 12hrs
Overview of SOAP;HTTP;XML; ROP;SOAP: Protocol; Message structure-Intermediaries;Actors;Design patterns and Faults;SOAP with attachments.

Unit 4: Web services 12hrs
Overview;Architecture-key technologies;UDDI;WSDL;ebXML;SOAP and web services in ECom;Overview of .NET and J2EE.

Unit 5: XML Security 12hrs
Security overview; canonicalization;XML security;Framework;XML Encryption; XML Digital signature;XKMS Structure;Guidelines for signing XML documents;XML in practice.

References:
Frank. P.Coyle. (2002)*XML, Web services and the data Revolution*. Pearson Education.
McGovern et al. (2005). *Java web services architecture*. Morgan Kaufmann Pub.
Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh (2004). *Developing java Web services.* Wiley Pub.
Sandeepchatterjee. (2004). *Developing Enterprise web services.* Pearson Education.

13MCA4S01 DATA AND KNOWLEDGE MINING

Credits: 3 **Total: 60 Hours**

Objectives:
To study the concept of Data Warehousing, Architecture, Online Analytical Processing (OLAP), Data mining and machine learning algorithms and their applications in Business.

Unit 1: Introduction to Data Warehousing **12hrs**

Introduction to Data warehousing - the need for data warehousing; Operational and informational Data stores; Data warehouse definition and characteristics; Data warehouse architecture.

Data warehousing component - Data warehouse Database; Sourcing; Acquisition; Clean up and transformation tools; Metadata; Access tools; Data marts; Data warehousing administration and management; Information delivery system.

Unit 2: Online Analytical Processing (OLAP) **12hrs**

ETL process; Fact Table; Dimension Table; Star Schema; Snow-flake schema; Online Analytical Processing (OLAP); Need for OLAP; Guidelines for OLAP - Multidimensional data model; Multidimensional vs. Multi-relational; Categorization of OLAP tools; OLAP tools internet.

Unit 3: Knowledge Mining and Business Intelligence **12hrs**

Introduction to data mining; The motivation, Learning from past mistake; Data mining; Measuring data mining effectiveness; Embedded data mining into business process; What is decision tree; Business score card; Where to use decision tree; The general idea; How the decision tree works; ID3 Algorithm.

Unit 4: Data Mining Techniques **12hrs**

Nearest neighbor and clustering; Where to use clustering and nearest neighbor prediction; How clustering and nearest neighbor prediction works; Types of Clustering; Genetic Algorithm; What are Genetic Algorithms; Where to use Genetic Algorithm.

Unit 5: XL Miner **12hrs**

Introduction to XL Miner; Problem Solving using XL Miner; Case Study: Segmenting; Clustering; Predicting; Classification.

References:

Alex Berson&Stephon J. Smith, (2003). *Data warehousing, Data mining and OLAP*. Tata McGraw Hill.

Fayyad, Usama M. et. Al, (2003). *Advances in knowledge discovery & Data mining*.

Galit Shmueli, Nithin R Patel and Peter C. Bruce, (2007) "*Data Mining for Business Intelligence-Concepts Techniques, and Applications in Microsoft Office Excel with XLMiner"*, Wiley-India Eduction.

Inmon.W.H, C. L. Gassey, (2004). *Managing the Data warehouse.* John Wiley & Sons

Inmon.W.H, (2002). *Building the Data warehouse*. John Wiley & Sons.

Margaret H. Dunham, (2003). *Data mining – Introductory and Advanced Topics.* Pearson Education, Prentice Hall.

Pang-Ning Tan, Michael Steinbach, &Vipin Kumar, (2006). *Introduction to Data mining.* Pearson Addison Wesley. MIT Press.

Rajeev Parida, (2006). *Principles and Implementation of Data warehousing.* Fire Wall Media, Lakshmi Publications.

Sam Anahory& Dennis Murray, (2003). *Data warehousing in the Real World – A Practical Guide for Building Decision Support Systems.* Pearson Education.

13MCA4T01 SOFTWARE TESTING AND QUALITY MANAGEMENT

Credits: 3 **Total: 60 Hours**

Objectives:

The course looks at the role of software test engineers in areas such as test plan, test design, test execution and defect tracking. It explains how to review and manage test requirements and how to incorporate testing into the software development life cycle.

Unit 1: Introduction to Software Testing 12hrs

Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Verification, Validation, Quality Control, Quality Assurance, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics, Origin of defects, Defect classes and Defect repository.

Unit 2: Testing in SDLC 12hrs

Review of software development models - Waterfall Models, Spiral Model, W Model, V Model, Agile Methodology and Its Impact on testing, Test Levels - Unit, Component, Module, Integration, System, Acceptance, Generic.

Unit 3: Types of Testing 12Hrs

Static Testing - Static Analysis, Control flow & Data flow, Determining Metrics; Dynamic Testing - Black Box Testing, Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques; White Box Testing, Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support; Gray Box Testing, Intuitive and Experience Based Testing

Unit 4: Test Management 12hrs

Test Organization - Test teams, tasks and Qualifications; Test Planning - Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria; Test Strategies - Preventive versus Reactive Approach, Analytical versus heuristic Approach; Test Activity Management, Incident Management, Configuration Management Test Progress Monitoring and Control; Specialized Testing - Performance, Load, Stress & Security Testing

Unit 5: Tools and techniques 12hrs

Automation of Test Execution, Requirement tracker, High Level Review ; Types of test Tools - Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non-functional testing; Selection and Introduction of Test Tools - Tool Selection and Introduction, Cost Effectiveness of Tool Introduction.

References:

AdityaP.Mathur, “Foundations of Software Testing”, Pearson Education, 2008.

Andreas Spillner, Tilo Linz, Hans Schaefer, “Software Testing Foundations “, Shoff Publishers and Distributors

Boris Beizer, “Software Testing Techniques”, Second Edition, Dreamtech, 2003

Elfriede Dustin, “Effective Software Testing”, First Edition, Pearson Education, 2003.

RenuRajani, Pradeep Oak, "Software Testing, Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004.
SrinivasanDesikan and Gopalaswamy Ramesh, "Software Testing, Principles and Practices", Pearson education, 2006.

13MCA4U01 MULTIMEDIA COMMUNICATIONS

Credits: 3 **Total: 60 Hours**

Objectives:

To study the graphics techniques and algorithms, the multimedia concepts and various I/O technologies and to enable the students to develop their creativity

Unit 1: Introduction 12hrs

What are Multimedia; multimedia application; Goal and objectives; Multimedia building blocks; Multimedia and Internet? Multimedia Configuration: Multimedia PC workstation components; multimedia platform; multimedia development tool; authoring tool; Interactivity; High end multimedia architectures; MULTIMEDIA OPERATING SYSTEM File system (File format: TIEF, BMP, PCX, GIF etc.); Process management; Multimedia Communication System; Multimedia Database Management System.

Unit 2: Multimedia Audio and Graphics 12hrs

Basic sound concepts; audio capture; music; speech sound processor; sound recovery technique; VOC4WAV file formats for sound;Multimedia graphics: 2D/3D animation fundamentals; color modules DIGITAL IMAGING: still and moving images; video capture animation video; Processing; video recovery techniques; AVO; AVI file formats; NTSC; PAL; SECAM; HDTV; system video/audio conferencing techniques and standards; video streaming; motion of synchronization.

Unit 3: Image Compression techniques 12hrs

LZW; DCT run length coding; JPEG; MPEG; standard hypertext MHEG; Hypertext and Hypermedia; document architecture ODA; MHEG.

Unit 4: Augmented and virtual reality and multimedia 12hrs

Concept; VR devices: hand Gloves; head mounted tracking system; V R Chair; CCD; VCR;3D; sound system; Head Mounted Displays and rendering software setup; Virtual objects; VRML.

Unit 5: Multimedia devices 12hrs

Mass storage systems for multimedia requirements; Magnetic devices; Optical devices; CDROM; DVD. Scanners: Types and specifications;Windows support to Multimedia: Multimedia Databases (in Oracle); multimedia function calls; windows support for sound; animation; movies; music and midi controls;Case study on Multimedia.

References:

Ralf Steinmetz &KlaraNahrStedt, (2003). *Multimedia - Computing, Communications and Applications.* PHI Publications.
Judith Jefcoate, (1998).*Multimedia in Practice, Technology and Application.* PHI.

Durano R Begault, (2003). *Virtual Reality and Multimedia.* AP Professionals.
Michael J Young, (2004. *Windows multimedia and animation with C++ programming for Win95.* AP Professional.
Kris Jama, Phil Schmauder, Nelson Yee, (2003). *VRML Programmer's Library.*Galgotia
Joe Gradicki, (1994). *Virtual reality Construction Kit.*Jhon Wile & Sons Inc.
Aitken Jarol, (1995). *Visual C++ Multimedia Adventure Set.* Coriolis Group books.

13MCA42L1 NETWORK PROGRAMMING LAB

1. Simple Message Passing Program.
2. Implementation of Client-Server Communication Using TCP.
3. Simple Chat Application
4. Implementation of File Transfer Protocol.
5. Implementation of CRC.
6. Implementation of Checksum.
7. Implementation of Bit Stuffing
8. Implementation of Sliding Window.
9. Implementation of Simple FTP client.
10. Reading IP and port ID from command line and sending message to server.
11. Implementation of Http Client.
12. Java Program for Message Group Window.

13MCA42P1 ENTERPRISE COMPUTING PROJECT

The main deliverables of the course come from a self-proposed project. Students (individually or teams of maximum 2) will design, propose, and implement a project relevant to the enterprise computing theme using J2EE technologies. Typically, this will be the construction of some system component supporting enterprise computing (e.g., electronic commerce or supply chain) or an enterprise application. Other ideas are certainly possible. You are encouraged to discuss your ideas with the instructor and TA before proceeding to the proposal stage. A project report must be submitted by each team as the deliverable.

13MCA5201 SOFTWARE PROJECT MANAGEMENT

Credits: 3 **Total: 60 Hours**

Objectives:

This course gives an overview of software project management, project planning, how to evaluate and assess the projects and to find the cost of the project using cost benefit evaluation techniques, to estimate the overall duration of the project by analyzing the risks involved in it, assess the risk of slippage so that project's requirements can be controlled, to select the most appropriate people for the project and to understand the role of continuing training and learning, to improve group working and to select appropriate leadership styles.

Unit 1: Introduction to Software Project Management 12hrs

Project Definition; Contract Management; Activities Covered By Software ProjectManagement; Overview of Project Planning; Stepwise Project Planning.

Unit 2: Project Evaluation 12hrs

Strategic Assessment; Technical Assessment; Cost Benefit Analysis;Cash Flow Forecasting; Cost Benefit Evaluation Techniques; Risk Evaluation.

Unit 3: Activity Planning 12hrs

Objectives; Project Schedule; Sequencing and Scheduling Activities;Network Planning Models; Forward Pass; Backward Pass; Activity Float; Shortening Project Duration; Activity on Arrow Networks; Risk Management; Nature Of Risk;Types Of Risk; Managing Risk; Hazard Identification;Hazard Analysis;Risk Planning And Control.

Unit 4: Monitoring and Control 12hrs

Creating Framework; Collecting The Data; Visualizing Progress; Cost Monitoring; Earned Value; Prioritizing Monitoring; Getting Project Back To Target; Change Control; Managing Contracts; Introduction; Types Of Contract;Stages In Contract Placement; Typical Terms Of A Contract; Contract Management Acceptance.

Unit 5: Managing people and Organizing Teams 12hrs

Introduction; Understanding Behavior; Organizational Behavior: A Background; Selecting The Right Person For The Job; Instruction In The Best Methods; Motivation; The Old man; Hackman Job Characteristics Model; Working In Groups; Becoming A Team, Decision Making; Leadership; Organizational Structures; Stress;Health And Safety; Case Studies.

Reference books:

Bob Hughes, Mikecotterell, (2004). *"Software Project Management"*, 3rd ed., Tata McGraw Hill.

Jalote, (2002). *"Software Project Management in Practice"*, Pearson Education.

Ramesh, Gopalaswamy, (2001). *"Managing Global Projects"*, Tata McGraw Hill.

Royce, (1999). *"Software Project Management"*, Pearson Education.

13MCA5202 INFORMATION SECURITY

Credits: 3 **Total: 60 Hours**

Objectives:

This subject aims to help students to get through knowledge about network and information security. At the end of the semester the students should have knowledge about various cryptographic algorithms and comparative study of the algorithms, about email security and secured electronic transactions and brief knowledge about intruders and viruses.

Unit 1: **12hrs**

Network Security Fundamentals: Introduction;Security Vulnerabilities and Threats; Classification of Security Services.

Cryptography: Encryption Principles; Conventional Encryption; DES; IDEA Algorithms, Modes of Operations; Location of Encryption Devices; Key Distribution.

Unit 2: **12hrs**

Message Digests and Checksums, Message Authentication; Message Digests; Hash Functions;MD5; SHA; Public Key Systems; RSA;Diffie-Hellman; Key Management; Confidentiality; Integrity; Non-Repudiation; Mechanisms; Non-Repudiation Process; Non-Repudiation Delivery.

Unit 3: **12hrs**

Authentication; Password-Based Authentication; Address-Based Authentication; Certificates; Authentication Services; Email Security; Threats; PGP; S/MIME; Firewalls-Design Principles; Packet Filtering; Access Control; Trusted Systems; Monitoring and Management.

Unit 4: **12hrs**

IP Security; IP Overview; IP security Architecture; Authentication Header; Encapsulating Security Payload; Key Management; Network Management; Web Security; Web Security Threats; Web Security Requirements; Secure Socket Layer.

Unit 5: **12hrs**

Transport Layer Security; Secure Electronic Transactions; Intruders: Intrusion Techniques; Intrusion Detection; Access Control and Management; Access Control Policies; Access Control Mechanisms; Viruses; Types of Viruses; Anti-virus Techniques.

References:

Atul Kahate,*Cryptographic and Network Security.* (2nd ed.).The McGraw Hill Publications,

Eric Maiwald, *Fundamentals of Network Security.* New Delhi:DreamTech Publishers

Eric Cole, *Network Security.* Wiley India Edition

William Stallings,(2002). *Network security Essentials: Applications and Standards.* (1st ed.) Pearson Education.

Kaufman Perlman and Speciner, (2002). *Network Security.* PHI Publications.

Roberta Bragg, Mark Rhodes, *Network Security: The Complete Reference,* McGraw Hill Publications.

William Stallings.(2004). *Cryptography and Network Security.* Pearson Education.

13MCA5203 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Credits: 3 **Total: 60 Hours**

Objectives:

- To introduce basic concepts, techniques of artificial intelligence and provide insights into active research.
- The goal of this course is to have students develop concepts and skills associated with problems that are classified as requiring intelligence for their solution.

Unit 1: Introduction to Artificial Intelligence **12hrs**

Definition,AI Applications, AI representation, Properties of internal representation, Heuristic search techniques, best first search, mean and end analysis, A* and AO* algorithm.

Unit 2: Game Playing and Artificial programming languages **12hrs**

Introduction to LISP: List manipulations, functions, predicates, and conditionals, input, output andlogical variables, iteration and recursion. Lists and arrays. Introduction to PROLOG.

Game Playing: Min-max algorithm, alpha-beta cutoff, waiting for quiescence, secondary search.

Unit 2: Knowledge Representation: **12hrs**

Knowledge Representation; Knowledge, general concepts, predicate logic, representing simple fact, instance and ISA relationships, resolution, natural deduction. Non monotonic reasoning, TMS (Truth Maintenance System), Semantic Nets, Frames, Scripts, Conceptual Dependency.

Predicate Logic: Representing simple facts in logic representing instance &its relationships, computable functions and predicates, resolution natural deduction.

Unit 4: Perception and NLP **12hrs**

Action, Robot architecture, vision, texture and images, representing and recognizing scenes, waltz algorithm, constraint satisfaction, trihedral and non-trihedral figures.

Natural Language Processing: NLP and pragmatic, syntactic and semantic analysis, RTN and ATN, understanding sentences.

Unit 5: Neural Networks and Expert systems **12hrs**

Introduction to Neural Networks, Neural Network architecture, Perceptron and applications of neural networks.

Expert System: Utilization and functionality, architecture of Expert System, Knowledge representation in expert systems and case studies.

References:

Graham, (1996). *ANSI Common LISP*, Prentice Hall.

Nilson N.J., (1980). *Principles of Artificial Intelligence*, Berlin: Springer Verlag.

Patterson, D.W, (1990). *Introduction to Artificial Intelligence and Expert System*, New Delhi: Prentice hall of India.

Rich, E & Knight, (2003). *Artificial Intelligence*, Tata McGraw Hill Publications

Rolston.D.W, *Principles of AI & Expert System Development*, Tata MacGraw Hill Publications

13MCA5A01 EMBEDDED SYSTEMS

Credits: 3 **Total: 60 Hours**

Objectives:

Embedded system is an emerging technology. There is a huge opening for Embedded System Engineers. In order to make the students aware this new technology this syllabus prescribed.

Unit 1: Introduction to 8051 microcontroller 12hrs

Comparison between micro controller and general purpose microprocessor; different types of microcontrollers; Architecture of 8051; key features of 8051; I/O ports; memory organization; counters and timers; serial I/O ports; interrupts of 8051.

Unit 2: 8051 Instruction Set & Assembly Language programming 12hrs

Addressing modes of 8051; instruction set; data move; arithmetic; logical; jump and call Instructions; Program for data transfer; Memory operations; arithmetic; logical; sorting.

Unit 3: Programming and Debugging Using Keil C 12hrs

Different types of Header files, declaration of variables, operators, Macro declaration; inclusion of files; I/O functions; String functions; Basic debugging concept; Logic analyzer programming; Timer simulation; I/O port simulation and debug; Program for RPM counting; Program for PWM.

Unit 4: External Peripheral Interfacing 12hrs

Interfacing switches; LEDs; Matrix Keyboard; Seven Segment Displays; 16 x 2 LCD; pulse measurement; analog to digital and digital to analog converters; interrupt programming; PC interfacing.

Unit 5: Real Time Software Development 12hrs

Architecture: Study of different architectures; simple Round Robin; Round Robin with Interrupt; Token passing method; Semaphores; Interrupt Latency; RTOS; RTOS applications;VxWorks RTOS study; RTC interfacing with RTOS; Selection procedure for Microcontrollers; SPI mode of operation.

References:

Douglas V Hall, (2000). *Microprocessor and Interfacing.* (3rd ed.). Tata McGraw Hill.

Kenneth J Ayala,(2005), *The 8051 microcontroller Architecture programming and Applications.*Penram International Publishing Pvt. Ltd.,

Muhammad Ali Mazidi and Mazidi&McKinlayR.D, (2006*).The 8051 Microcontroller and Embedded system.*

Raj Kamal, (2005), *Microcontroller Architecture programming Interfacing and system design,*Pearson Education.

Ram.B, (2000), *Fundamentals of Microprocessor & Microcomputer*. DanpatRai Publication.

13MCA5B01 COMPILER DESIGN

Credits: 3 **Total: 60 Hours**

Objectives:

To learn and understand the design of a compiler and also the knowledge of using the tools for construction of a compiler

Unit 1: **12hrs**

Introduction to Compiler; Compiler and Translators; Phases of Compilation; One pass compiler; Lexical Analysis; Role of Lexical Analyzer; Regular Expressions; Finite Automata; Design of lexical Analyzer; Context free grammars; Parse trees; Ambiguous grammars.

Unit 2: **12hrs**

Parsers; Shift reduce parsing; Operator precedence parsing; Top down parsing Predictive parsers; Simple precedence parsers; LR parsers; SLR parser tables; LALR parsing tables.

Unit 3: **12hrs**

Syntax directed translation; Construction of syntax trees; Evaluation of S attributed and L attributed definitions; Top down Translation; Recursive evaluators; Type checking; Simple type checker; Type conversions; Overloading of functions and operators; Polymorphic functions; Run time environment; Source language issues; Storage organization; Storage Allocation; symbol tables; Dynamic storage allocation techniques.

Unit 4: **12hrs**

Intermediate code generation; Languages; Declarations; Assignment statements; Boolean expression; Case statements –Backpatching, Procedure Calls.

Unit 5: **12hrs**

Code optimization; Sources of optimization; Basic blocks; Loops; Global Data Flow analysis; Solution of data flow equations; Code improving transformations; Dealing with aliases; Data Flow analysis of flow graphs; Symbolic debugging of optimized code; Code generations; Issues in the design of code generator; Simple code generator Register allocation and assignment; DAG representations; PEEP hole optimization; generation of code from DAG's; Code generation algorithm.

References:

Aho Ravi Sethi A.V and J.D Ullman,(2004). *Compiler, Principles, Techniques and Tool.* Pearson Education.

Aho Ravi Sethi and J.D Ullman, (1987). *The Principles of Compiler Design.*Narosa Publishing House.

Bennet.J.P, (2003). *Introduction to Compiler Techniques. (2nd ed.).* Tata McGrawHill.

Dhamdhere.D.M, (1983). *Compiler Construction Principles and Practice.* McMillian India Ltd.

Galles, *Modern Compiler Design.*

Kenneth C. Louden, (2003). *Compiler Construction: Principles and Practice.* Thompson Learning.

13MCA5C01 SIMULATION AND MODELING

Credits: 3 **Total: 60 Hours**

Objectives:
To understand the needs for simulation and simulation methodologies.

Unit 1: System Models and Behaviors **12hrs**
Concept of a system; environment; stochastic activities; continuous and discrete system; system modeling; types of models; system studies.

Unit 2: Analytical System Simulation Techniques **12hrs**
Monte-Carlo methods; Numerical computation techniques; Lag models; distribute lag model and cob-web model.

Unit 3: Simulation Languages **12hrs**
Introduction to Simscript; management of sets in Simscript; GPSS; GPSS model of a simple telephone system data structures.

Unit 4: Simulation System building paradigms **12hrs**
Time-oriented and event-oriented; message-oriented; knowledge-based Simulation engine development; Analysis of simulation output: Estimation methods; simulation statistics; replication of runs; batch means; regenerative techniques; time series analysis; spectral analysis and autoregressive means.

Unit 5: Simulation of Business Applications **12hrs**
Equipment maintenance; warehouse management; facility utilization; workflow management; project management.

References:
Birta, Loius G and Arbez, Gilbert A, *Modeling and Simulation: Exploring Dynamic System Behaviour*, Springer.
Caroll J. M, (2004). *Simulation using personal computers*, 001.64044, C239.
Gordon G, (2003). *System simulation.* Prentice Hall
GottfriedB. S, *Elements of stochastic process simulation*, 001.424, G71E.
Law,Averill M, *Simulation Modeling and Analysis.* (3rd ed.),Tata McGrawHill.
Seila, Andrew, *Applied Simulation Modeling*, Thomson Learning,

13MCA5S01 DATA ANALYTICS

Credits: 3 **Total: 60 Hours**

Objectives:
The course is designed to provide in-depth knowledge of handling data and Business Analytics tools that can be used for fact-based decision-making. At the end of the course, the participants will be able to:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- Use decision-making tools/Operations Research techniques.
- Use advanced analytical tools to analyze complex problems under uncertainty.

Unit 1: Business Statistics 12hrs

Introduction to software's R, SPSS and Rapid Miner; Different types of data; Data Visualization; Data summarization methods; Tables, Graphs, Charts, Histograms, Frequency distributions, Relative frequency measures of central tendency and dispersion; Box Plot; Descriptive Statistics Chebychev's Inequality on relationship between the mean and the standard deviation of a probability distribution. Basic probability concepts, Conditional probability, Bayes Theorem, Probability distributions, Continuous and discrete distributions,

Unit 2: Predictive Analytics 12hrs

Contents: Regression models Simple linear regression: Coefficient of determination, Significance tests; and Residual analysis; and Confidence and Prediction intervals multiple linear regressions: Coefficient of multiple coefficient of determination; Interpretation of regression coefficients; Non- linear regression; Logistic regression.

The focus will be case-based practical problem-solving using predictive analytics techniques to interpret model outputs. Software tools such as MS Excel, SPSS, and R and how to use these software tools to perform regression; logistic regression and forecasting.

Unit 3: Estimation and hypothesis testing 12hrs

Sequential decision-making Sampling and estimation: Estimation problems; Point and interval estimates Hypothesis testing: Null and alternate hypotheses; Types of errors, Level of significance; Power of a test; ANOVA Test for goodness of fit; Non-parametric tests.Software tools such as MS Excel, SPSS, and R.

Unit 4: Data mining tools 12hrs

Classification and predictive modelling using Rapid Miner; Case study and interpretation of results obtained.Software tools such as MS Excel, and Rapid Miner to perform data mining.

Unit 5: Advanced Analytics 12hrs

Principal component analysis, Factor analysis, conjoint analysis, Discriminant analysis, Forecasting: Moving average, Exponential smoothing, Trend, Cyclical and seasonality Components, Software tools such as MS Excel, SPSS, and R.

Reference Books:

Albright Winston Zappe, (2006).*Data Analysis and Decision Making with Microsoft Excel Hobson Publications*, 3rd Edition.

Conrad Carlberg,(2008). *Business Analysis with Microsoft Excel, Pearson Education*, 3rd Ed.

Naresh K. Malhotra,(2003) *Marketing Research an Applied Orientation*, Pearson Education.

Thomas Devonport, (2007) *Competing on analytics: The new science of winning*

13MCA5T01 SOFTWARE TESTING TOOLS

Credits: 3 **Total: 60 Hours**

Objectives:

The course is designed to get awareness and knowledge of software testing tools knowledge to make the software testing life cycle easy for execution. It explains the usage of different tools in different testing types, test management, defect life cycle.

Unit1: Introduction to Software Testing tools 12hrs

An overview of Software testing tools; Open source tools; Licensed tools; Unit Testing tools; Functional automation testing tools; Performance testing tools: Load, Stress, Volume; Defect tracking tools, Test repository tools, Test management tools.

Unit 2: Unit Testing tools 12hrs

JUnit – Java unit testing tool, C++ Test – C/C++ Unit testing tool, Rational Test RealTime Unit Testing tool.

Unit 3: Automation and Performance Testing tools 12hrs

Automation testing tools : Selenium; software testing framework for web applications; Quick Test Professional; Keyword view; Expert view, Languages; Sikuli – to automate and test graphical user interfaces using screenshots; Silk Test – functional automation testing tool; Performance testing tools : Load Runner – application load testing, JMeter – heavy load simulator, Rational Performance Tester – IBM's performance testing tool to emulate various loads.

Unit 4: Mobile testing tools 12hrs

Mobile Application testing tools: Mobile phone emulator, MobiReady, Responsivepx; Mobile Performance testing tools: mobitest, neotys, BlazeMeter; Mobile automation testing tools: eggON, Monkeytalk, Experitest

Unit 5: Test Management and Defect Tracking Tools 12hrs

HP Quality Center – test management tool, TestLink – open source web based test management tool, IBM Rational Quality Manager; Defect Tracking tools: Bugzilla – bug tracking tool, ClearQuest – Rational's bug tracking tool.

References:

Dr. K.V.K.K. Prasad, "Software Testing Tools", Dreamtech Press.

http://www.junit.org

http://www.mobiready.co.uk

http://www.onestoptesting.com/introduction/

13MCA5U01 DIGITAL IMAGE PROCESSING

Credits: 3 **Total: 60 Hours**

Objectives:

To study the image fundamentals and mathematical transforms necessary for image processing, image enhancement techniques, image restoration procedures, image compression procedures and image segmentation and representation techniques

Unit 1: Digital image fundamentals 12hrs

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, Mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

Unit 2: Image Enhancement 12hrs

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image enhancement.

Unit 3: Image Restoration 12hrs

Image Restoration - degradation model, unconstrained restoration - Lagrange multiplier and constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

Unit 4: Image Segmentation 12hrs

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed 87, segmentation algorithm.

Unit 5: Image Compression 12hrs

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

References:

Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

Dudgeon.D.E and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.

Kenneth R. Castle man, Digital Image Processing, Pearson, 2006.

Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION',

Rafael C. Gonzalez, Richard E. Woods,, Digital Image Processing', Pearson, Second Edition, 2004.

Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002

13MCA52P1 SOFTWARE PROJECT MANAGEMENT LAB

The students are supposed to develop a mini – project and also must manage the development process using any project management tools available. The students can do the project in a group (team) consisting of not more than 2 students. The project management principles must span across all the phases of a project. The team members will be able to demonstrate competency in the management of a projectplan, especially in monitor and controlling a project schedule and budget, trackingprojectprogress.A project report must be submitted by each team.

13MCA5 (A/B/C) P1 ELECTIVE III PROJECT

The students are supposed to develop a mini – project for above mentioned lab. The students can do the project in a group (team) consisting of not more than 2 students. A project report must be submitted by each team.

13MCA5AP1	Embedded Systems Project
13MCA5BP1	Compiler Design Project
13MCA5CP1	Simulation and Modeling Project

13MCA62P1 MAIN PROJECT

Individual Project Work and Viva Voce: 200 Marks

Duration of the project is four months.

During the project work the students should interact with the internal / external guides.

Project review will be conducted twice in a month.

Internal marks for the project will be based on all the reviews and final demo of the project

Internal Marks: 50 and External Project Viva – Voce Marks: 150

Internal Marks

Each Review - 5 Marks (8 Reviews * 5 = 40 Marks)

Preparatory Demo - 10

External Project Viva – Voce Marks

Report	25
Presentation	75
Viva – Voce	50

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