DEPARTMENT OF COMPUTER SCIENCE
BIT MESRA

Course Structure for BE(Computer Science)

	Course No	Subjects	L	T	P	CP
	GROUP-A					
	I- SEMESTER					
	HU-1101	Technical English	3	0	0	3
	PH1201	Physics	3	1	0	4
	MA1201	Engg. Mathematics	3	1	0	4
	EE2201	Principles of Electrical Engg	3	1	0	4
	CH1401	Engg. Chemistry	3	0	0	3
	ME1202	Engg. Graphics	1	0	3	3
	CS1302	Fundamental of Unix & C Programming	1	0	3	3
	PE1202	Workshop Practice	0	0	3	2
	PH1202	Physics lab	0	0	3	2
	GA1002/4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 29
	II- SEMESTER					
	EC2001	Principle of Electronics Engg	3	0	0	3
	MA2201	Advance Engg Mathematics	3	1	0	4
	CH2203	Environmental Science	3	0	0	3
	CS2301	Fundamentals of Data Structure	3	1	0	4
	ME2001	Principles of Mechanical Engg	3	0	0	3
	AM1201	Engineering Mechanics	3	1	0	4
	CH1402	Chemistry Lab	0	0	3	2
	EE3202	Basic Electrical Engg Lab	0	0	3	2
	EC2002	Basic Electronics Engg Lab	0	0	3	2
	CS2302	Data Structure Lab	0	0	3	2
	GA2002/4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 30
GROUP-B						
	I- SEMESTER					
	EC2001	Principle of Electronics Engg	3	0	0	3
	PH1201	Physics	3	1	0	4
	CH1401	Engg. Chemistry	3	0	0	3
	MA1201	Engg. Mathematics	3	1	0	4
	AM1201	Engineering Mechanics	3	1	0	4
	ME1202	Engg. Graphics	1	0	3	3
	CS1302	Fundamental of Unix & C Programming	1	0	3	3
	CH1402	Chemistry Lab	0	0	3	2
	EC2002	Basic Electronics Engg Lab	0	0	3	2
	GA1002/4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 29
II-SEMESTER						
	HU1101	Technical English	3	0	0	3
	MA2201	Advance Engg Mathematics	3	1	0	4
	CH2203	Environmental Science	3	0	0	3
	CS2301	Fundamentals of Data Structure	3	1	0	4
	ME2001	Principles of Mechanical Engg	3	0	0	3
	EE2201	Principles of Electrical Engg	3	1	0	4
	PH1202	Physics lab	0	0	3	2

	PE1202	Workshop Practice	0	0	3	2
	AM2202	Engineering Mechanics Lab	0	0	3	2
	CS2302	Data Structure Lab	0	0	3	2
	GA2002/4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 30
		III- SEMESTER				
	CS 3005	Object Oriented Programming using Java	3	0	0	3
	EC 3201	Digital Electronics	3	1	0	4
	CS 4101	Discrete Mathematical Structures	3	0	0	3
	CS 6101	Design and Analysis of Computer Algorithms	3	0	0	3
	BT3021/HU4001	**Biological Science/Language *(Breadth Paper)***	3	0	0	3
	Sessionals					
	EE3202/AM2202	Basic Electrical Engg. lab/Engg. Mechanics lab	0	0	3	2
	CS 3006	Object Oriented Programming Lab.	0	0	3	2
	EC 3202	Digital Electronics Lab.	0	0	3	2
	GA3002/ 4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 23
		IV- SEMESTER				
	MA 4109	Probability, Statistics and Numerical Techniques	3	0	0	3
	CS 4205	Database Management Systems	3	0	0	3
	CS 4109	Computer System Architecture	3	1	0	4
	CS 4107	Operating System	3	0	0	3
	HU4001/ BT 3021	Foreign Language/ Biological Sciences	3	0	0	3
	Sessionals					
	CS 4206	DBMS Lab.	0	0	3	2
	MA 4110	Numerical Techniques Lab.	0	0	3	2
	CS 4108	Operating System Lab.	0	0	3	2
	GA4002/ 4/6/8	NCC / NSS / PT & Games / C. Arts	0	0	2	1
						Total 23
		V- SEMESTER				
	CS 6107	Computer Networks	3	0	0	3
	EC 4205	Microprocessor and Microcontroller	3	0	0	3
	CS 5101	Formal Language & Automata Theory	3	1	0	4
	CS 8101	Artificial Intelligence and Expert Systems	3	0	0	3
		Breadth Subject-V	3	0	0	3
	Sessionals					
	CS 6108	Computer Networking Lab.	0	0	3	2
	EC 4206	Microprocessor Application Lab.	0	0	3	2
	CS 8102	Artificial Intelligence Lab.	0	0	3	2
						Total 22
		VI- SEMESTER				
	CS 6105	Compiler Design	3	0	0	3
	CS 6011	Computer Graphics and Multimedia	3	0	0	3
	CS 6109	Software Engineering	3	0	0	3
	CS 6103	System Programming	3	1	0	4
		Breadth Subject-VI	3	0	0	3
	Sessionals					
	CS 6106	Compiler Design Lab.	0	0	3	2
	CS 6110	Software Engg. Lab.	0	0	3	2
	CS 6012	Computer Graphics and Multimedia Lab.	0	0	3	2

						Total 22
		VII- SEMESTER				
	CS 5105	Soft Computing	3	0	0	3
	Departmental Elective - I	Departmental Elective - I	3	0	0	3
		Breadth Subject-VII	3	0	0	3
	Sessionals					
	CS 5106	Soft Computing Lab	0	0	3	2
	CS 7014	Project	0	0	0	4
						Total 15
		VIII- SEMESTER				
	CS 8031	Data Mining & Data Warehousing	3	0	0	3
		Departmental Elective - II	3	0	0	3
		Departmental Elective – III	3	0	0	3
Sessionals						
CS 8014	Project	Project	**0**	**0**	**0**	**6**
						Total 15
						Total Credits=179

Departmental Electives [Group I]

1.	CS 7029	Free/Open Source software	
2.	CS 7117	Optimization Techniques	
3.	CS 7121	Cryptography and Network Security	
4.	CS 7029	Information Security and Assurance	
5.	CS 7101	Principles of Programming Languages	
6.	CS 7107	Digital Image Processing	
Departmental Electives [Group II]			
1.	EC 8201	Mobile & Cellular Communication	
2.	EE 4207	Digital Signal Processing	
3.	CS 7033	Multimedia Technology	
4.	CS 8029	Parallel & Distributed Systems	
5.	CS 8111	Natural Language Processing	
6.	CS 8121	Pattern Recognition	
7.	CS 8113	Computational Geometry	
Departmental Electives [Group III]			
1.	CS 8123	Real Time Systems	
2.	CS 8125	Computer Vision	
3.	CS 8127	Computing and Complexity Theory	
4.	EC 4201	VLSI Design	
5.	CS 7127	Software Project Management	
6.	CS 7123	Bio Informatics	
7.	CS 7125	Object Oriented Analysis and Design	

Breadth - V(Elective)					
Course Code	**Subject**	**L**	**T**	**P**	**C**
	Principles of Management	3	0	0	3
PE 5009	Industrial Organization and Management	3	0	0	3
	Organisation Behavior	3	0	0	3
	Art and Culture	3	0	0	3
	Sociology and Environmental Psychology	3	0	0	3
PE 5011	Project Engineering	3	0	0	3
Breadth - VI(Elective)					
	Business Economics	3	0	0	3
PE 6009	Engineering Economy	3	0	0	3
	Financial Management	3	0	0	3
Breadth - VII(Elective)					
	IPR	3	0	0	3
	Business and Industrial Laws	3	0	0	3
	Entrepreneurship	3	0	0	3
	Professional ethics	3	0	0	3

SEMESTER - I

CS 1302 FUNDAMENTALS OF UNIX & C PROGRAMMING Credit-3

MODULE – I [6 lectures]

The Free Software Movement, Open source definition, Open source business strategy, Problem Solving and its tools, Flow chart, Pseudo code, Modular programming. Fundamentals of Unix Operating System, Login & Password, Different Commands, Unix directory, Structure and working with directories, Vi-editor, Basic Structure and execution of C programmes, Constants, Variables, and Data Types and various type of declarations, Different type operators and Expressions, Evaluation of Expressions, Operator Precedence and Associability, Mathematical Functions.

MODULE –II [4 lectures]

Managing Input and Output operations, Decision Making and Branching Decision Making and Looping.

MODULE – III [5 lectures]

One – dimensional Arrays and their declaration and Initialisations, Two-dimensional Arrays and their initialisations, Multidimensional Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on characters, Putting Strings together, Comparison of Two Strings, String – handling functions.

MODULE –IV [5 lectures]

Need and Elements for user –defined Functions, Definition of Functions, Return values and their types, Function calls and Declaration, Arguments and corresponding return values, Functions that return multiple values, Nesting of functions, Recursion, Passing arrays and strings to functions, The Scope, Visibility and Life time of variables.

MODULE –V [5 lectures]

Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialisation of Structure, Comparing Structure Variables, Operation on Individual Members, Arrays of Structures, Structures within structures, Structures and Functions, Unions, Size of Structures, Bit Fields.

MODULE – VI [6 lectures]

Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialisation of Pointer Variables, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays, Pointers and Character Strings, Arrays of Pointers, Pointers and Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers and Structures,

MODULE – VII [4 lectures]

File Management in C. use of fopen(), fclose(), Formatted file I/O, Searching through files using fseek(), ftell(), rewind().

Text Book :

1. Kernighan K. R., Ritchie D. M. - The C Programming Language, Ansi C Edition, Prentice Hall, India

Reference:

1. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi ; 2004
2. A. N. Kanthane – Programming with ANSI and TURBO C, Pearson Education, New Delhi; 2004
3. Y. Kanetkar – Let us C, 4th Edition, BPB Publication , New Delhi; 2002
4. Chris DiBona, Sam Ockman , Open Sources : Voices from the Open Source Revolution (Web book), Oreilly Press, 2nd edition,1999

SEMESTER II

CS 2301 FUNDAMENTALS OF DATA STRUCTURES
Credit-4

MODULE – I [5 lectures]
Algorithms and Analysis of Algorithms: Definition, Structure and Properties of Algorithms, Development of an Algorithm, Data Structures and Algorithms, Data Structure – Definition and Classification, Efficiency of Algorithms, Apriory Analysis, Asymptotic Notations, Time Complexity of an Algorithm using *O* Notation, Polynomial Vs Exponential Algorithms, Average, Best and Worst case Complexities, Analyzing Recursive Programs, Open source software development process.

MODULE – II [5 lectures]
Arrays, Stacks and Queues: Array Operations, Number of Elements in an Array, Representation of Arrays in Memory, Applications of Array, Stack-Introduction, Stack Operations, Applications of Stack, Queues-Introduction, Operations on Queues, Circular Queues, Other Types of Queues, Applications of Queues.

MODULE – III [5 lectures]
Linked List, Linked Stacks and Linked Queues: Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Multiply Linked Lists, Applications of Linked Lists, Introduction to Linked Stack and Linked Queues, Operations on Linked Stacks and Linked Queues, Dynamic Memory Management and Linked Stack, Implementations of Linked Representations, Applications of Linked Stacks and Linked Queues.

MODULE – IV [6 lectures]
Trees, Binary Trees, BST, AVL Trees and B Trees: Trees: Definition and Basic Terminologies, Representation of Trees, Binary Trees: Basic Terminologies and Types, Representation of Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Applications, BST & AVL Trees: Introduction, BST:

Definition and Operations, AVL Trees: Definition and Operations, B Trees: Introduction, m-way search trees: Definition and Operations, B Trees: Definition and Operations.

MODULE – V [5 lectures]
Graphs: Introduction, Definitions and Basic Terminologies, Representations of Graphs, Graph Traversals, Single-Source Shortest-Path Problem, Minimum Cost Spanning Trees.

MODULE – VI [5 lectures]
Sorting: Introduction, Shell Sort, Quick Sort, Heap Sort.

MODULE – VII [4 lectures]
Searching: Introduction, Binary Search, Transpose Sequential Search, Interpolation Search.

Text Book:

5. G A V Pai – Data Structures and Algorithms: Concepts, Techniques and Applications, 2nd Edn, Tata McGraw-Hill, 2008

6. Horowitz E.Sahni, S., Susan A., Fundamentals of Data Structures in C, 2nd Edition, University Press, 2010

Reference Books:

2. J. P. Tremblay **,** P. G. Sorenson – An Introduction to Data Structures With Applications, 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.

3. Seymour Lipschutz – Data Structures, 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.

4. Adam Drozdek – Data Structures and Algorithms in C++, Thomson Learning, New Delhi – 2007.

5. J. Feller, B. Fitzgerald -Understanding Open Source Software Development, Pearson Education Ltd. New Delhi

SEMESTER-III

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, B. I. T. MESRA

CS 6101 DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS
Credit-3

MODULE -I

Basic Tools on Designing Algorithms: What is an algorithm? Algorithm specification and performance analysis, randomized algorithms.

MODULE –II

Divide-and-Conquer: The general method, application to binary search, finding the maximum and minimum, merge sort, quick sort, the problem of selection and Strassen's matrix multiplication.

MODULE -III

The Greedy Method: The general method, application to optimal storage on tapes, job sequencing with deadlines, optimal merge patterns and minimum weight spanning trees.

MODULE –IV & V

Dynamic Programming: The general method, application to multistage graphs, all pairs shortest paths, optimal binary search trees,0/1-Knapsack and traveling salesman problem, Flow shop scheduling

Backtracking: The general method, application to 8- puzzle problem, 8- queen problem and sum of subsets.

MODULE -VI

Branch and Bound: The method, application to 0/1 Knapsack traveling salesman problems, and efficiency considerations.

MODULE -VII

NP-Hard and NP-Complete Problems: Introduction and basic concepts, non-deterministic turing machine, the classes of P and NP, NP-hard graph problems, NP-completeness of the satisfiability problem, and polynomial- space-bounded problem.

Text Book:

7. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition

Reference Books:

6. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006

7. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005
8. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi - 2007

EC3201 Digital Electronics Credit- 4

MODULE – I

Simplification of Boolean Expressions: Gate-level minimization, NAND and NOR implementation, POS & SOP simplification, Karnaugh map, Quine McCluskey method

Text Books:

1. "Digital Logic and Design", M. Mano. PHI
2. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

MODULE – II

Design of Combinational Circuits: Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, magnitude comparator, Parity Generators and Checkers, Signed number system, BCD adder/subtractor, carry look ahead adder

Text Books:

1. "Digital Logic and Design", M. Mano. PHI
2. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

MODULE – III

Sequential Circuits: Basic Concepts, Flip-Flop, RS, JK, Master Slaves, T and D Flip-Flops, Controlled Registers, Shift Registers and their applications, Synchronous and asynchronous counters, Controlled Counters, Up/Down counters, Ring counter

Text Books:

1. "Digital Logic and Design", M. Mano. PHI
2. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

MODULE – IV

Analysis of Clocked Sequential Circuits: State equation, state table and state diagram, input equations, Analysis with various flip flop, State reduction and assignment, Design of clocked sequential circuits

Text Books:

1. "Digital Logic and Design", M. Mano. PHI

MODULE – V

Introduction to Various Logic Families: Electrical characteristics of logic gates TTL gates, CMOS gates, Static CMOS Design; Dynamic hazards, Ratioed Logic, Pass-transistor logic, Transmission gate logic

Text Books:

1. "Digital Logic and Design", M. Mano. PHI
2. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

MODULE – VI

Multivibrators: Types of multivibrators, AMV, MMV and BMV using transistors, AMV and MMV using OP-AMP, Schmitt Trigger

Text Books:

1. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

MODULE – VI I

Memories and Programmable Logic Devices: Memory organization and operation, write and read operations, Read only memories, PROMs, EPROMs, EEPROMs, RAMs: Static RAM, Dynamic RAM, Design of an 8x4 ROM, PLA, PAL, Generic array logic, CPLD, FPGA

Text Books:

1. "Modern Digital Electronics", 3/e, R.P.Jain, TMH

CS 4101 DISCRETE MATHEMATICAL STRUCTURES Credits-4

Module – I & II

Logic and Mathematical Reasoning: Logic, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Recursive Definition and Algorithms, Program Correctness.

Module – III & IV

Functions and Relations: Functions, Sequences and Summations, The Growth Functions, Relations and Their Properties, Non- array Relations & Their Applications, Representing Relations, Closures of Relations, Equivalence Reloans, Partial Orderings.

Module – V

Graphs: Introduction to Graphs, Graph Terminology and Representation, Connectivity, Euler and Hamiltonian Paths, Shortest Path Programs.

Module – VI

Trees: Introduction and applications of trees, Tree Traversal, Spanning Trees, Minimum Spanning trees.

Module –VII

Semigroups, Groups and Coding: Binary Operations, Semigroups, Products and Quotients of Semigroups, Groups, Product and Quotients of Groups, Coding of Binary Information and Error Correction, Decoding and Error Correction.

Text Books:

1. B.Kolman et.al- Discrete mathematical Structures, 5th Edn, Pearson Education, New Delhi - 2004.

2. K.H. Rosen – Discrete Mathematics and Its Applications – 4th Edn, Tata McGraw

Hill, New Delhi - 2001

Reference Books:

1. J.P. Tremblay et.al – Discrete Mathematical Structures with Applications to

Computer Science, TMH, New Delhi – 2004.

CS 3005 Object Oriented Programming using Java Credit -3

Module 1 [Lectures - 2]

Introduction to OOP, Objects and classes, Characteristics of OOP, Difference between OOP and Procedure oriented programming. Introduction to Java Programming, Features of Java, Applications and Applets, JDK, Source File Structure

Module 2 [Lectures - 4]

Java language fundamentals, Building blocks of Java, Data Types, Variable declaration, Wrapper classes, Operators and Assignment, Control Structures, Arrays, Strings, StringBuffer class

Module 3 [Lectures - 10]

Java as an OOP Language, Defining classes, Modifiers, Packages, Interfaces, Exception Handling, Exception hierarchy, Constructors and methods of Throwable class, Unchecked and Checked Exceptions, Handling Exceptions in Java, Exception and Inheritance, Throwing user defined exceptions, Redirecting and rethrowing exceptions.

Module 4 [Lectures - 4]

Multithreading, Overview of threading, Creating threads, Thread Life-cycle, Thread priorites and Thread scheduling, Thread synchronization, Daemon Threads, Thread groups, Communication of Threads

Module 5 [Lectures - 5]

Files and I/O Streams, Java I/O, File Streams, FileInputStream and FileOutputStreams, Filter streams, Random Access files, Serialization

Module 6 [Lectures - 4]

Applets, Java Applications versus Java Application, Applet Life cycle, Working with Applets, The HTML APPLET Tag, java.Applet package

Module 7 [Lectures - 6]

AWT, Basic classes in AWT, Drawing with Graphics Class, Class hierarchy of AWT, Event Handling, Adapter classes, AWT Controls, Layout Managers, Swings, Swings packages, Hierarchy of Swing classes, Advanced layout Managers, Additional Swing Components.

Text Book

Krishna P. R., Object Oriented Programming through JAVA, 1st Edition, Universities Press, 2008

Reference Books

1. Dietel,Dietel - Java How to program , 7th edition; Pearson Education , New Delhi.
2. C. Horstmann,G. Cornell - Core Java 2 Vol I & Vol II ; Pearson Education , New Delhi.
3. Balagurusamy -Programming in Java, 2nd Edition; Tata McGraw Hill Publication; New Delhi.
4. Patrick Naghton & H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.

SEMESTER IV

CS 4109 COMPUTER SYSTEM ARCHITECTURE Credit- 4

MODULE I

(DESIGN METHODOLOGY)

System Design, System Representation, Design Process, the Gate level

The Register Level Devices. Register-Level Components, Programmable Logic Devices, Register-Level

The Processor Level Processor- level Components, Processor-level Design

MODULE II

PROCESSOR BASICS

CPU Organization Fundamentals, Additional Floating-Point Numbers

Data Representation Basic Format, Fixed-Point Numbers, Floating-Point Numbers

Instruction Sets Instruction Formats and Types

MODULE III

DATAPATH DESIGN

Fixed-Point Arithmetic Addition, Subtraction, Multiplication and Division

Arithmetic Logic Units Combinational ALUs, Sequential ALUs

MODULE IV

CONTROL DESIGN

Basic Concepts	Introduction, Hardwired Control	
Microprogrammed	Basic Concepts, Multiplier Control Unit	
Control	Pipeline Control	Instruction Pipeline, Arithmetic Pipeline

MODULE V

MEMORY ORGANIZATION

Memory Technology	Memory Device Characteristics, Random Access Memories, Serial Access Memories
Memory Systems	Multilevel Memories, Address Translation, Memory Allocation
Cache	Main Features, Address Mapping

MODULE VI

SYSTEM ORGANIZATION

Communication Methods	Basic concepts Bus Control
System Control	DMA and Interrupts

MODULE VII

ADVACED TOPICS

Pipeline Processing, Parallel Processing

Text Book

1. Hayes, J.P., "Computer Architecture and Organization", 3rd ed McGraw-Hill, London , 2000

Reference Books

1. Mano, M.M., "Computer System Architecture" , Prentice Hall of India, New Delhi, 1995
2. Heuring V.P., etal., " Computer System Design and Architecture", Addision Wesley Indian Reprint, 2000
3. Hamacher.V., etal, (Computer Organzation" ,4th edition, McGraw Hill, Singapore, 1996
4. Ram. B."Computer Fundamentals: Architecture and Organization",3rd ed New Age International Publication, New Delhi, 2000

CS 4205 DATABASE MANAGEMENT SYSTEM

Credit - 3

Module – I

Introduction: Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users Administrator

Database Design and Entity - Relational Model: Overview of Design process, E-R model, Constraints, E-R diagrams, Week Entity Sets, Extended E – R Features.

Module – II

Relational Model: Structure of Relational Database, Fundamental Relational Algebra, Operation, Additional Operations, , Tuple Relational, Calculus.

Module – III

SQL and Advanced SQL: Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, NULL values, Nested Sub-queries, complex queries, views, modification of database, SQL data types & schemas, Integrity constraints, Authorization, Embedded SQL.

Module – IV

Relational Database Design: Atomic domains and First Normal form, Decompositions using functional dependencies, Functional dependencies, Decomposition using multivalued dependencies, more normal forms.

Module – V

Indexing and Hashing: Basic concepts, Ordered Indices, B+ Tree Index Files, B Tree Index files, Multiple Key Access, Hashing, Comparison of Ordered Indexing and Hashing

Module VI

Query processing- Overview, measures of query cost, selection operation, sorting join operations

Module – VII

Transaction & Concurrency Control: Transaction Concepts & ACID Properties, Transaction States, Concurrent Executions, Serializability & Its Testing, Recoverability, Introduction to Concurrency Control, Locked Base Protocol & Deadlock Handling. Timestamp-Based Protocols. Validation-Based Protocols. Multiple Granularity.

Text Book:

1. A.Silberschatz et.al - Database System Concepts, 5th Edn, Tata Mc-Graw Hill, New Delhi – 2000.

Reference Books:

1. Date C.J. - An Introduction to Database System, Pearson Education, New Delhi, 2005

2. R.Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.

MA 4109 Probability, Statistics and Numerical Techniques

Module – I

High Speed Computation: Introduction, Computer Arithmetic, Errors, Machine Computation.

Transcendental and Polynomial Equations: Introduction, Bisection Method, Iterative Methods, Rate of Convergence, Methods for Complex Roots, Polynomial Equations. [5L]

Module –II

System of Linear Algebraic Equations and Eigen value Problems: Introduction, Direct Methods, Error analysis, Iteration Methods, Eigen values and Eigen Vectors. Interpolation and Approximation: Introduction to Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomial using finite differences, Hermit interpolations, Piecewise and spine interpolation. [5L]

Module – III

Differentiation and Integration: Introduction, Numerical differentiation, Numerical integration, Methods based on interpolation. Ordinary Differential Equations: Introduction, Euler methods, Single and Multistep methods, Predictor-corrector methods. [5L]

Module– IV

Graphical Statistics-histogram, scatter plot, ogive, bar diagrams (including multiple and percentage), average, dispersion, skewness and kurtosis and their statistical measures, Exploratory Data Analysis, Empirical and classical definitions of Probability, Addition theorem, Conditional Probability, multiplication theorem, Independent Events, Bayes Theorem. [5L]

Module – V

Random variables and Probability distributions, Discrete, Continues & Multivariable Distributions: Mathematical Expectation, Bernoulli Trials and the Binomial Distribution, The Moment – Generating Function, The Poisson Distribution, The Uniform and Exponential Distributions, The Normal Distribution, Distributions of Functions of a Random Variable, Distributions of Two Random Variables.

[5L]

Module VI

Sampling Distribution Theory: Independent Random Variables, Distributions of Sums of Independent Random Variables, Random Functions Associated with Normal Distributions, The Central Limit Theorem, Approximations for Discrete Distributions, The t and F Distribution. The Gamma and Chi-Square Distributions. [5L]

Module – VII

Estimation & Tests of Statistical Hypotheses: Point Estimation, test of significance and Confidence Intervals for Means, Confidence Intervals for Difference of Two Means, Sample Size, Tests about Proportions, Tests of the Equality of Two Normal Distributions, Chi-Square Goodness of Fit Tests, Contingency Tables, Tests of the Equality of Several Means, F test for equality of two population variances [5L]

Text Books:

1. Jain, M.K., et. al: Numerical Methods for Scientific and Engineering Computation, 3rd Edn. New Age Publication, New Delhi , 1999
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

Reference Books:-

1. Sastrty, S.S. – Introductory Methods of Numerical Analysis, 4th Edn., PHI, New Delhi, 2005
2. Hines, W.W. et al – Probability and Statististics in Engineering, 4th edn., John Witey, Singapore (Indian Reprint), 2003.
3. Veerarajan, T. – Probability, Statististics and Random Processes, 2nd Edn., TMH, New Delhi, 2003.

CS 4107 OPERATING SYSTEM Credit-3

MODULE – I

Introduction: What is an Operating System? Simple Monitor, Performance, Multiprogramming, time-sharing, Real Time systems, Protection. (5)

File Systems: File Concept and support, Access and allocation methods, directory systems, File protection. (3)

MODULE – II

CPU Scheduling: Scheduling concepts and algorithms, Algorithms evaluation, and Multiple processor scheduling.
(6)

MODULE – III

Memory Management: Preliminaries, Bare Machine, Resident Monitor, Swapping, Multiple partitions, Paging, Segmentation, Combined systems.
(8)

MODULE – IV

Virtual Memory : Overlays, Demand paging, Performance of demand paging, Page replacement, Virtual memory concepts, Page replacement algorithms, Allocation algorithms, and Thrashing. (8)

MODULE – V

Disk Scheduling: Physical characterization, Disk Management, Swap-Space Management, RAID structure, FCFS scheduling and Shortest-Seek-Time-First. (6)

MODULE – VI

Deadlocks: The deadlock problem, Deadlock characterization, Deadlock prevention, Deadlock avoidance; Deadlock detection, Recovery from deadlock, and combined approach to deadlock handling. (4)

MODULE – VII

Process Synchronization: Semaphores, OS Synchronization, Atomic Transaction.

Security: The Security Problem, User Authentication, Cryptography.

Text Book:

1 Silver Schatz, A and Golvin, P.B. 'Operating System Concepts', 5th Edn. John Wiley, New Yark, 2000

Reference Books:

1. Deitel H.M., 'An Introduction to Operating System', Addison Wesley, Inc., London, 1995.
2. Mandinck S.E., 'Operating System' McGraw Hill., London, 1993.

SEMESTER V

EC4205 MICROPROCESSOR AND MICROCONTROLLER

Module – 1:

Revision of logic circuits with emphasis on control lines, SAP concepts with stress on timing diagrams, Microinstructions, Microprogramming, Variable machine cycle, Architecture of 8085 Processor , Functions of all signals, Bus concepts, Multiplexed and De-multiplexed Bus, Minimum system.

Text Books:

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

Module – 2:

Instruction set, Addressing modes, Stack operation, Timing diagrams, Programming examples like Time delay, Looping, Sorting, Code conversions like BCD to Binary, Binary to BCD, HEX to ASCII, ASCII to HEX, BCD Arithmetic etc.

Text Books:

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

Module – 3:

8085 based Microcomputer system, Memory Organization, Memory Interfacing, Memory Mapped I/O, I/O Mapped I/O, Interrupts, Hardware and Software Interrupts, Interrupt instructions, Programmed I/O, Interrupt driven I/O, DMA.

Text Books:

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

Module – 4:

Architecture of 8255 I/O peripheral chip, Modes of operation, Hand shake mode operation, BSR mode, ADC 0801 and ADC 0808 Interfacing with 8085 microprocessor, Analogue multiplexed ADC, DAC 0808 specifications, DAC Interfacing, Programming examples for Generation of square wave, positive and negatives ramps, triangular and sine waves, Sample and Hold circuit, LF 398 and its applications in Data Acquisition.

Text Books:

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085". by R. S. Gaonkar.
3. "Microprocessor and Interfacing, Programming of Hardware" by Douglas Hall.
4. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.

Module – 5:

8253 timer, Modes of operation, Applications, 8279 Keyboard/Display Interface, Different modes of operation, Interfacing, Programming examples, 8237 DMA Controller

Text Books:

1. "Microprocessor and Interfacing, Programming of Hardware" by Douglas Hall.
2. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.
3. "The INTEL 8086/8088 Microprocessor, Architecture, Programming, Design and Interfacing", 3/e. by Bhupendra Singh Chhabra.

Module – 6:

Introduction to 8086 microprocessor, Architecture of 8086, pins description and memory bank interfacing. Addressing modes and instruction sets of 8086. Interfacing examples with PPI 8255 and ADC 0801 and ADC 0808

Text Books:

1. "Microprocessor, Microcomputer and their Applications", 2/e. by A, K. Mukhopadhyay.
2. "Advanced Microprocessor" by Y. Rajasree.
3. "The INTEL 8086/8088 Microprocessor, Architecture, Programming, Design and Interfacing", 3/e. by Bhupendra Singh Chhabra.

Module - 7:

Evolutionary steps and Additional features of 80186, 80286, 80386, 80486 and Pentium Processors, Concept of CISC and RISC processors

Text Books:

1. "Microprocessor, Microcomputer and their Applications", 2/e. by A, K. Mukhopadhyay.
2. "Advanced Microprocessors" by Y. Rajasree.
3. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.

CS 6107 COMPUTER NETWORKS

MODULE -I

Foundation: Applications, Requirements, Network Architecture, Implementing Network Software, Performance.

MODULE –II

Direct Link Networks: Hardware Building Blocks, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Detection, Reliable Transmission,

MODULE III

Ethernet (802.3), Token Rings (802.5, FDDI), Wireless (802.11), Network adaptors.

MODULE –IV

Internetworking: Simple Internetworking (IP), Routing, Global Internet,

MODULE V

Multicast, Multiprotocol Label Switching (MPLS).

MODULE -VI

End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Remote Procedure Call.

MODULE -VII

Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms, Quality of Service.

Text Book:

1 L.L. Peterson & B.S. Davie- Computer Networks: A Systems Approach, 3rd Edition, Morgan Kaufman Publication, New Delhi, 2006

Reference Books:

3. A. Forouzan - Data communications and Networking, 4th Edn., TMH, New Delhi, 2006

4. P.C. Gupta- Data Communications and Computer Networks, PHI, New Delhi, 2006**.**

CS 8101 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM

Module I

Overview of Artificial Intelligence: Definition & Importance of AI.

Knowledge: General Concepts: Introduction, Definition and Importance of Knowledge, Knowledge-Based Systems, And Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, And Acquisition of Knowledge.

Module II

LISP and Other AI Programming Languages: Introduction to LISP : Syntax and Numeric Function, Basic List Manipulation Functions in LISP, Functions, Predicates and Conditionals, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, PROLOG and Other AI Programming Languages.

Module III

Knowledge Representation: Introduction, Syntax and Semantics for Propositional logic, Syntax and Semantics for FOPL, Properties of Wffs, Conversion to Clausal Form, Inference Rules, The Resolution Principle, No deductive Inference Methods, Representations Using Rules.

Module IV

Dealing with Inconsistencies and Uncertainties: Introduction, Truth Maintenance Systems, Default Reasoning and the Closed World Assumption, Predicate Completion and Circumscription, Modal and Temporal Logics.

Probabilistic Reasoning: Introduction, Bayesian Probabilistic Inference, Possible World Representations, Dumpster-Shafer Theory, Ad-Hoc Methods.

Module V

Structured Knowledge: Graphs, Frames and Related Structures: Introduction, Associative Networks, Frame Structures, Conceptual Dependencies and Scripts.

Object-Oriented Representations: Introduction, Overview of Objects, Classes, Messages and Methods, Simulation Example using an OOS Program.

Module VI

Search and Control Strategies: Introduction, Preliminary Concepts, Examples of Search Problems, Uninformed or Blind Search, Informed Search, Searching And-Or Graphs.

Matching Techniques: Introduction, Structures Used in Matching, Measures for Matching, Matching Like Patterns, Partial Matching.

Module VII

Knowledge Organization and Management: Introduction, Indexing and Retrieval Techniques, Integrating Knowledge in Memory, Memory Organization Systems.

Expert Systems Architectures: Introduction, Rule Based System Architecture, Non-Production System Architecture, Dealing with uncertainty, Knowledge Acquisition and Validation, Knowledge System Building Tools.

Text Book:

1. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.

Reference Books:

1. E. Rich & K. Knight - Artificial Intelligence, 2/e, TMH, New Delhi, 2005.

2. P.H. Winston - Artificial Intelligence, 3/e, Pearson Edition, New Delhi, 2006.

3. D.W. Rolston,- Principles of AI & Expert System Development, TMH, New Delhi.

CS 5101 FORMAL LANGUAGES AND AUTOMATA THEORY

MODULE - I

Introduction to Automata: Study and Central concepts of automata theory, An informal picture of finite automata, deterministic and non-deterministic finite automatas, applications of finite automata, finite automata with epsilon – transitions.

MODULE - II

Regular expression and languages: Regular expressions, finite automata and regular expressions, applications of regular expressions, algebraic laws of regular expressions.

MODULE - III

Properties of Regular Languages: Proving languages not to be regular, closure properties of regular languages, equivalence and minimization of automata.

MODULE - IV

Context – free Grammars and Languages: Parse trees, Applications of context free grammars, Ambiguity in grammars and languages.

MODULE - V

Pushdown Automata: Pushdown automation (PDA), the language of PDA, equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

MODULE - VI

Properties of Context – Free Languages: Normal forms of context free grammars, pumping lemma for context free languages, close properties of context free languages.

MODULE - VII

Introduction to Turing Machine: The Turing machine, programming techniques for Turing machine, extensions to the basic Turing machine, restricted Turing Machines, Turing Machines and Computers.

Text Books:

1. J.E. Hopcroft , et.al. - Introduction to Automata Theory, Languages and Computation, 2nd Edn. Pearson Education , New Delhi 2001

Reference Books:

1. K.L.P. Misra – et.al. - Theory of Computer Science, 2nd Edn. PHI, New Delhi, 2000

5. J.C. Martin - Introduction to Languages and the Theory of Computation 2nd Edn, TMH, New Delhi, 2000.

SEMESTER-VI

CS 6105 COMPILER DESIGN

MODULE -I

Introduction to Compiling: Compilers, Analysis of the source program, the phase of a compiler, Cousins of the compiler, the grouping of phases, Compiler-constructions tools.

MODULE -II

A Simple One-Pass Compiler: Syntax definition, Syntax-directed translation, Parsing, A translator for simple expressions, Lexical analysis, Incorporating a symbol table, Abstract stack machines.

MODULE-III

Lexical Analysis: The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language of specifying lexical analyzers, Design of a lexical analyzer generator.

MODULE –IV

Syntax Analysis: The role of the parser, writing a grammar, Top-down parsing; Bottom-up parsing, Operator-precedence parsing, LR parsers, Using ambiguous grammars, Parser generators.

MODULE V

Syntax-Directed Translation: Syntax-direct definitions, Constraction of syntax trees, Bottom-up evaluation of S-, attributed definitions, L-attributed definitions, and Top-down translation.

Type Checking: Type systems, Specification of a simple type checker.

MODULE VI

Run-Time Environments: Source language issues, Storage organization, Storage-allocation strategies, Access to nonlocal names, Parameter passing, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques.

MODULE VII

Intermediate **Code Generation:** Intermediate languages, Declarations, Assignment statements, Boolean expressions.

Code Generation: Issues in the design of a code generator, Target machine, Run-time storage management, Basic blocks and flow graphs.

Code Optimization: Introduction, The Principle sources of optimization.

Text Book:

1. A.V.Aho, R. Sethi et.al.- Compilers Principles, Techniques, and Tools, 2nd Edition, Pearson Education, New Delhi, 2006

Reference Books:

1. A.I.Holub -Compiler Design in C, Prentice Hall of India, New Delhi, 1995
2. J.P. Tremblay - The Theory and Practical of Compiler Writing, McGraw Hill, Singapore, 1993.
3. K.C. Louden- Compiler Construction: Principles and Practice, Thomson Learning, New Delhi, 2005.

CS 6011 COMPUTER GRAPHICS AND MULTIMEDIA

Module-I

Introduction and Overview of Graphics Systems:- Use of Computer graphics, Video Display Devices, Refresh Cathode-Ray Tubes, Raster and Random Scan Displays, Colour CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality Systems, Raster and Random Scan Systems, Different Input and Hard Copy Devices, Graphics Softwares.

Module-II

Output Primitives: - Points and Lines, Line Drawing Algorithms (DDA & Bresenham's), Circle and Ellipse Generating Algorithms, Conic Sections.

Module-III

Two-Dimensional Geometric Transformations:- Different types of transformations and their matrix representations, Homogeneous Coordinates, Composite Transformations, transformations between Coordinate Systems, Affine transformations, Window-to-Viewport Coordinate transformation, Clipping- Point, Line, Polygon, Curve and Text Clipping.

Module-IV

Three-Dimensional Concepts and Object Representation:- Three Dimensional Display Methods, Polygon Surfaces, Curved Lines & Surfaces, Quadric Surfaces, Spline Representations, Cubic Spline interpolation methods, Bezier Curves and Surfaces.

Module-V

Three Dimensional Transformations and Viewing: Translation, Rotation, Scaling, Reflection, Shears, Composite Transformations, Projections- Parallel and Perspective, Projection Transformations, Clipping.

Module-VI

Visible Surface Detection Methods: Classification of Visible Surface Detection Algorithms, Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan-Line Method, Depth Sorting Method, BSP-Tree Method & Area Subdivision Method. Polygon- Rendering Methods.

Module-VII

Introduction to Multimedia Systems Design:

An Introduction – Multimedia applications – Multimedia System Architecture – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video – Multimedia Authoring & User Interface – Hypermedia messaging -

Text Book:

1. D. Hearn & M.P. Baker - Computer Graphics, 2/e , Pearson Education, New Delhi, 2005
2. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2005

Reference Books:

1. W.M. Newman. et. al.- Principle of Interactive Computer Graphics, Mc Graw Hill Publication, New Delhi, 1995.
2. S. Harrington -Computer Graphics- A Programming Approach, Mc Graw Hill Publication, New Delhi, 1994.
3. J.D. Foley et. al- A Fundamental of Computer Graphics Addition Wesley, London, 1993.

CS 6103 SYSTEM PROGRAMMING

MODULE – I

Background: Introduction, System Software and Machine Architecture, The Simplified Instructional Computer (SIC), Traditional (CISC) machines, RISC Machines.

MODULE – II & III

Assemblers: Basic Assembler Functions, Machine – Dependent Assembler Features, Machine – Independent Assembler Features, Assembler Design Options, Implementation Examples.

MODULE – IV & V

Loaders and Linkers: Basic Loader Functions, Machine - Dependent Loader Features, Machine – Independent Loader Features, Loader Design Options, Implementation Examples.

MODULE – VI

Macro Processors: Basic Macro Processor Functions, Machine – Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

MODULE – VII

Software Engineering Issues: Introduction to Software Engineering Concepts, System Specifications, Procedural System Design, Object – Oriented Design, System Testing Strategies.

Text Book:

1. L. L. Beck – System Software – An Introduction to Systems Programming, 3rd Edn.,

   Pearson Education, New Delhi, 2004

Reference Book:

1. J.J. Donovan – System Programming, McGraw Hill , New Delhi, 1993.
2. D.M. Dhamdhere – System Programming and Operating Systems, 2nd Edn., Tata McGraw Hill , New Delhi, 2000

CS 6109 SOFTWARE ENGINEERING

MODULE – I

Introduction: Some Definitions, FAQs about software engineering, the evolving role of software, Software characteristics, SW applications

Software Processes: Software process models, Waterfall model, the prototyping model, spiral model, RAD and Incremental model.

MODULE – II

Project Management: Management activities, Project planning, Project scheduling, Risk Management.

MODULE – III

Software Requirements: Functional and non functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS.

Requirement Engineering Process: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management.

MODULE – IV

Software Design: Design Concepts and Principles, Architectural Design, Object oriented Design, User interface design

UML: Class diagram, Sequence diagram, Collaboration diagram

MODULE – V

Verification and Validation: Verification and Validation Planning, S/W inspection, static analysis.

Software Testing : Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability.

MODULE – VI

Management: SW cost estimation: Estimation techniques, Algorithmic cost modeling, Project duration and staffing.

Quality Management: Quality assurance and standards, Quality planning, Quality control.

MODULE – VII
Software Change: Program Evolution Dynamic, S/W Maintenance in detail.

Text Book:

1. I. Sommerville : Software Engineering, Pearson Education Publication, 7th ed.

Reference Book:

1. R. S. Pressman: Software Engineering: A Practiioners Approach, 5th Edn., TMA, New Delhi.
2. *J. F. Peters & W. Pedrycz– Software Engineering, John Wiley & Sons,Inc. 2000*
3. A.Behforooz & F.J. Hudson – Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.

SEMESTER-VII

CS 5105 SOFT COMPUTING

FUZZY LOGIC

MODULE -I

Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement.

MODULE -II

Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning.

MODULE –III
Fuzzy Inference System Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tekamoto Fuzzy Models.

GENETIC ALGORITHMS

MODULE –IV

Fundamentals of Genetic Algorithms: Basic Concepts Creation, Offspring's Encoding, Fitness functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.

ARTIFICIAL NEURAL NETWORKS

MODULE -V

Introduction, Architecture, Back Propagation and feed Forward Networks, Offline Learning, Online Learning.

MODULE -VI

Supervised Learning of Neural Networks: Introduction, Perceptrons, Adaline, Back Propagation Multilayer Perceptrons, Back Propagation Learning Rules, Methods of Speeding. Radical Basis Function Networks, Functional Expansion Networks.

MODULE -VII

Unsupervised Learning : Competitive Learning Networks, Kohonen self-organising networks, Hebbian Learning, The Hopfield Network

Text Book :

1. J.S.R. Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi 2004.
2. S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI, New Delhi 2003

Reference Books:

1. T. J. Ross, "Fuzzy Logic with Engineering Applications." TMH, New York, 1997.

CS 7107 DIGITAL IMAGE PROCESSING

Module I

Introduction: Background, Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, Imagining Geometry.

Module II

Image Transforms: Introduction to the Fourier Transform, The Discrete Fourier Transform, Some Properties of the Two-Dimensional Fourier Transform, Other Separable Image Transforms.

Module III

Image Enhancement : Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Background, Smoothing Filters, Sharpening Filters, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency Domain Specifications.

Module IV & V

Image Restoring: Degradations Model - Definitions, Degradation Model for Continuous Functions, Diagonalization of Circulant and Block-Circulant Matrices, Circulant Matrices, Block Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration, Unconstrained Restoration, Constrained Restoration, Inverse Filtering – Formulation, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, Geometric Transformation.

Module VI & VII

Image Compression: Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models – The Source Encoder and Decoder, The Channel Encoder and Decoder. Elements of Information Theory – Measuring Information, The Information Channel, Fundamental Coding Theorems, Using Information Theory. Error-Free Compression – Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.

Text Book:

1. Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 2/e Pearson Education, New Delhi - 2006

Reference Books:

1. W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. 2006

2. M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.

CS 7121 CRYPTOGRAPHY & NETWORK SECURITY

Module I

Security Services, Mechanisms and Attacks, The OSI Security Architecture, A Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotol Machines, Steganography.

Module II

Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Module III

Finite Fields and Confidentiality : Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF (p), Polynomial arithmetic, Finite Fields of the Form GF(2"), Placement of Encryption Function, Traffic Confidentially, Key Distribution, Random Number Generation.

Module IV

Encryption Standard and Ciphers : Evaluation criteria for AES, AES cipher, Multiple encryption and Triple DES, Block ciper Modes of operation, Stream ciphers and RCG.

Module V

Number Theory and Public-Key Cryptography: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public-Key Cryptosystems, The RSA Algorithm,

Module VI

Message Authentication, Function, Algorithms and Digital System :Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions,

MODULE VII

Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols.

Text Book:

1. W.Stallings : Cryptography and Network Security : Principles and Practice, 4/e

Pearson Education, New Delhi, 2006.

Reference Books:

1. B.A. Forouzan – Cryptography and Network Security, TMH, New Delhi, 2007
2. B. Schneier – Applied Cryptography, John Wiley, Indian Edition, 2006.

CS 7031 DATA MINING & DATA WAREHOUSEING

Module - I

Data Mining : Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Module - II

Data Warehouse : Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining.

Module - III

Data Processing : Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation.

Data Mining Primitives, Languages and System Architecture : Data Mining Primities, DMQL, Architectures of Data Mining Systems.

Module – IV

Concept Description : Data Generalization & Summarization – Based Characterization, Analytical Characterization, Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases.

Module - V

Mining Association Rules in Large Databases : Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining.

Module - VI

Classification and Prediction : Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule, Other Classification, Prediction, Classification Accuracy.

Module - VII

Cluster Analysis : Types of Data in Cluster Analysis, Partitioning methods, Hierarchical methods, Density – Based Methods, Grid – Based Methods, Model – Based Clustering Methods, Outlier Analysis.

Mining Complex Types of Data.

Text Books :

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques
   Publisher Harcout India. Private Linited.

Reference Books :

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

SEMESTER-VIII

CS 8029 PARALLEL AND DISTRIBUTED SYSTEMS

Introduction: Computational Demand of Modern Science, Advent of Practical rocessing, Parallel Processing Terminology- Contrasting Pipelining and Data arallelism, Control Parallelism, Scalability, Control-Parallel Approach, Data-Parallel Approach with I/O.

Module-II

PRAM Algorithm: A Model of Serial Computation, The PARAM Model of Parallel Computation, PARAM Algorithm- Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Colouring, Problem defining Fast Solutions on PRAMS.

Module-III

Elementary Parallel Algorithm: Classifying MIMD Algorithm, Reduction. Matrix Multiplication: Sequential Matrix Multiplication, Algorithms for Processor Array, Algorithms for Multiprocessors.

Module-IV

Solving Linear Systems: Terminology, Back Substitution, ODD-EVEN Reduction, Gaussian Elimination, The JACOBI Algorithm, The Gauss-Seidel Algorithm, Jacobi Overrelaxation and Successive Overrelaxation, Mulyigrid Methods, Conjugate Gradient.

Module-V

Basic Algorithms in Message-Passing Systems: Formal Models for Message Passing Systems, Broadcast and Convergecast on a Spanning Tree, Flooding and Building a Spanning Tree, Constructing a Depth-First Search Spanning Tree for a

Specified Root, Constructing a Depth-First Search Spanning Tree without a Specified Root.Leader Election in Rings: The Leader Election Problem, Anonymous Rings, Asynchronous Rings, Synchronous Rings.

Module-VI

Mutual Exclusion in Shared Memory: Formal Model for Shared Memory Systems, The Mutual Exclusion Problem, Mutual Exclusion using Powerful Primitives, Mutual Exclusion using Read/Write Registers. A formal Model for Simulations: Problem Specifications, Communication Systems, Processes, Admissibility, Simulations, Pseudocode Conventions.

Module- VII

Broadcast and Multicast: Specification of Broadcast Services, Implementing a Broadcast Service, Multicast in Groups, An Application: Replication Distributed Shared Memory: Linearizability Shared Memory, Sequentially Consistent Shared Memory, Algorithms, Lower Bounds.

Text Books:

1. H.Attiya & J. Welch- Distributed Computing- Fundamentals, Simulations and Advanced Topics,2nd Edn., Wiley India Publication, New Delhi, 2006.
2. M.J. Quinn-Parallel Computing-Theory and Practice, 2nd Edn., McGraw Hill Inc., New York.

CS 8121 PATTERN RECOGNITION

Module I

Pattern Recognition Overview: Overview, Pattern Recognition, Classification and Description, Patterns and Feature Extraction, Training and Learning in PR Systems, Pattern Recognition Approaches.

Module II

Statistical Pattern Recognition: Introduction, The Gaussian case and Class Dependence Discriminate Functions, Extensions, Classifier Performance, RISK and Errors.

Module III

Supervised Learning: Parametric Estimation and Supervised Learning, Maximum Likelihood Estimation Approach, Bayesian Parameter Estimation Approach, Non – Parametric Approaches, Parzen Windows, K-nn Non-Parametric Estimation. Nearest Neighbour Rule.

Module IV

Linear Discriminate Functions and The Discrete and Binary Feature Cases: Introduction, Discrete and Binary Classification Problems, Techniques to Directly Obtain Linear Classifiers.

Module V & VI

Syntactic Pattern Recognition: Overview Quantifying Structure in Pattern Description and Recognitions, Grammar Based Approach and Application, String Generation as Pattern Description. Recognition by String Matching and Parsing. The Cocke-Younger Kasami ((ck) parsing algorithm.

Module VII

Neural Pattern Recognition: Introduction to Neural Networks, Neural Network Structure from Pattern Recognition Applications. Physical Neural Network. The Artificial Neural Network Model, Neural Network Based Pattern Associators.

Text Book:

4. Robort Schalkoff - Pattern Recognition, Statistical, Structural and Neural Approach, John Wiley, Indian Edition, 200.

Reference Books:

1. R. U. Duda – Pattern Classification, John Wiley, Indian Edition, 2006.