File Ref.No.6912/GA - IV - J1/2013/CU

UNIVERSITY OF CALICUT

Abstract

Scheme and Syllabus of M.Sc Computer Science for the Teaching Department in the University(CCSS-PG)- revised - implemented with effect from 2014 admissions-orders issued.

G & A - IV - J

U.O.No. 9879/2014/Admn Dated, Calicut University.P.O, 25.10.2014

Read:-1)U.O.No.GAI/J1/1373/08 dated 01.07.2008.

2)GA IV/J1/4639/10 Dt 24.01.2012

3) Item No: 1of the Minutes of the meeting of the Board of Studies in Computer Science held on 6.8.14

4) Remarks of the Dean, Faculty of Science on 24.09.2014

5) Orders of the Vice-Chancellor in the file of even Number on 13.10.2014

ORDER

As per paper read as (1) above, Choice based Credit Semester System at Post Graduate level in University Teaching Departments/Schools has been implemented from the academic year 2008-2009 onwards. As per paper read as (2) above, the syllabus of MSc Computer Science for Teaching Department under CCSS -PG was approved and implemented.

The Board of Studies at its meeting, vide paper read as (3) above, revised the syllabus of M.Sc.Computer Science of Universaity Teaching Department and has forwarded the Scheme and Syllabus to the University. As per paper read as (4) above, the Dean, Faculty of Science has recommended to approve item No 1 to 4 of the minutes of Board of studies and the syllabus of MSc Computer Science- CCSS PG.

The Hon'ble Vice Chancellor, considering the exigency, exercising the powers of the Academic Council , has approved the item No 1 to 4 of the minutes of the meeting of the BOS in Computer Science, subject to ratification by the Academic Council, vide reference cited 5th.

Sanction has therefore been accorded to implement the scheme and syllabus of M.Sc.Computer Science programme of the University Teaching Departments under CCSS PG w.e.f 2014 admission onwards.

Orders are issued accordingly. Scheme and Syllabus appended. (The syllabus is available in the website: universityofcalicut.info)

Muhammed S

Deputy Registrar

To

Controller of Examination

Exam Wing, Pareekshabhavan

Digital Wing, Calicut University

University Teaching Department

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

DEPARTMENT OF COMPUTER SCIENCE

Regulations, Scheme of Evaluation Course, Structure Syllabus for

MASTER OF SCIENCE (M.Sc.)

in

COMPUTER SCIENCE

(Choice Based Credit Semester System – CCSS
For the students admitted from the Academic Year 2014-15 onwards)

Under the

FACULTY OF SCIENCE

August, 2014

REGULATIONS

The existing regulations of Choice-based Credit Semester System (UO No. GA1/J1/1373/2008 Dated 01-07-2008) which are applicable for University Teaching Departments are also applicable for this Programme with the following exceptions.

I. Objectives:

The course of the MSc (Computer Science) Programme is designed with the following objectives:

- To equip students to take up challenging research oriented responsibilities and courses for their higher studies/profession.
- To train and equip the students to meet the requirements of the Software Industry in the country and outside.
- To motivate and support the students to prepare and qualify challenging competitive examinations such as JRF/NET/JAM/GATE etc.

II. Programme Structure

1. **Duration** of the course shall be 2 years, divided into 4 semesters. The entire period of the four semester shall be divided for one core and one elective courses and for the Project Work.
2. **Selection and Eligibility for Admission** is based on the existing University rules.
3. **Evaluation** of all semester theory papers will be on the basis of existing CCSS norms.
4. **Conduct of Practical Examinations**: Odd semester Practical Examinations will be conducted internally by the Department and Even Semester Examinations will be conducted by the Controller of Examination.
5. **Term Paper:** A term paper is introduced in the third semester with the following objectives.
   - To familiarize the student to the techniques of literature survey and to conduct a study/analysis result in a critical review of the recent research work/technology innovations related to Computer Science.
   - To acquaint with the process of presenting the work through seminars and technical reports.

   The student is expected to do an extensive literature survey and analysis in a research/innovations/technology area related to Computer Science, under the supervision of a faculty member from the Department. The student has to choose an area\topic for his/her work after due consultation and approval from the guide (students can refer articles from

ACM/IEEE/INFLIBNET Journals/Conference Proceedings and/or equivalent documents, standard textbooks and web based material, approved by the supervisor)

The study should preferably result in a critical review of the recent research works/technology advancements/ innovations/ algorithms/theoretical contributions in the form of theorems and proofs/new methods of proof/new techniques or heuristics with analytical studies/implementations and analysis of results.

The student should give a seminar on his/her work, during the semester, and submit a technical report.

Evaluation: For the evaluation of the term paper, an evaluation committee is to be constituted. One faculty is to be designated as the Course Coordinator for this course. Committee is to be constituted by the Head of the Department (HOD) and (s)he shall be the Chairperson of the committee. In addition to the HOD, the Course Coordinator, the faculty guiding a particular student will also be a member of the committee. The Coordinator has to set the schedule for presentation and submission of the reports. While calculating the final score, 25% weight is to be given for the scores awarded by the guide to the student and the rest 75% weight is to be given for the average of the scores awarded to the student by remaining committee members.

A tentative list of the components for evaluation of Term Paper is as shown below. Evaluation committee can decide about the actual composition of the components and scores to be awarded for each component.

Components
Relevance of the Topic, Statement of Objectives, Correctness
Quality of Literature Survey / Analysis of results
Methodology / Tools adopted
Quality of Implementation/Simulation /Testing
Identification of Future Work
Quality of the Term Paper Report
Quality of Presentation
Publications out of the Term Paper

6. **Project Work & Viva**: The Project work should be carried out over the period of 16 weeks in the final semester in an Industry / R & D organization / Department/Institution. If the project is carried out in an Industry / R & D organization outside the campus, then a co-guide shall be selected from the Department/ Institution concerned. Every student should do the Project individually and no grouping is allowed. All the candidates are required to get the approval of their synopsis and the guide before commencement of the project from the Department / Institution and the matter may be intimated to the University at the beginning of the semester by the Department / Institution. The project will be reviewed periodically every month by the Department / Institutional. The continuous assessment marks (CA) will be based on the periodic progress and progress report.

   At the end of the semester the candidate shall submit the Project report (two bound copies and one soft copy) duly approved by the guide, co-guide for End Semester Assessment. Evaluation for ESA should be conducted by a board of examiners appointed by the University. (Mark Distribution: Content 30% + Methodology 30 % + Presentation 20 %, and Via- voce 20 %). If project work and the report are found to be not up to the expected standard, the examiners can ask the candidate to modify and resubmit the project report after incorporating the suggestions of the examiners. Such reports shall be resubmitted within the stipulated period suggested by the examiner(s).

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UNIVERSITY OF CALICUT

Department of Computer Science

M.Sc. Computer Science

Under CCSS (with effect from 2014 Admission)

COURSE STRUCTURE AND SCHEME OF EVALUATION

Semester 1

Sl. No	Course Code	Course	Instructional Hrs/week		Exam Duration		Marks			Credit
			Lect./ Lab	Tutorial	Theory	Practical	ESA	CA	Total	
1	CS1C01	Discrete Mathematical Structures	3	1	3	---	80	20	100	4
2	CS1C02	Advanced Data Structures and Algorithms	3	1	3	----	80	20	100	3
3	CS1C03	Principles of Programming Methodology	3	1	3	----	80	20	100	4
4	CS1C04	Theory of Computation	3	1	3	----	80	20	100	4
5	CS1C05	Computer Organization and Architecture	3	1	3	----	80	20	100	4
6	CS1C06	Practical 1	10	5	---	3	80	20	100	3
	Total		25	10	-	-	-	-	600	22

Semester 2

Sl. No	Course Code	Course	Instructional Hrs/week		Exam Duration		Marks			Credit
			Lect. / Lab	Tutorial	Theory	Practical	ESA	CA	Total	
1	CS2C07	Design and Analysis of Algorithms	3	1	3	---	80	20	100	4
2	CS2C08	Advanced Database Management System	3	1	3	----	80	20	100	4
3	CS2C09	Operating System Concepts	3	1	3	----	80	20	100	4
4	CS2C10	Object Oriented Programing with Java	3	1	3	----	80	20	100	3
5	CS2E01-07	Elective 1	3	1	3	----	80	20	100	4
6	CS2C11	Practical 2	10	5	---	3	80	20	100	3
	Total		25	10	-	-	-	-	600	22

Elective 1	Credit
CS2E01 - Artificial Intelligence	4
CS2E02 - Information Theory and Coding	4
CS2E03 – Computer Graphics	4
CS2E04 – Advanced Microprocessor and Micro Controller	4
CS2E05– Numerical and Statistical Methods	4
CS2E06 – Distributed Computing	4
CS2E07 – Simulation and Modelling	4

Semester 3

Sl. No	Course Code	Course	Instructional Hrs/week		Exam Duration		Marks			Credit
			Lect. / Lab	Tutorial	Theory	Practical	ESA	CA	Total	
1	CS3C12	Advanced Java Programming	3	1	3	---	80	20	100	3
2	CS3C13	Principles of Compiler Design	3	1	3	----	80	20	100	4
3	CS3C14	Data Communication and Networking	3	1	3	----	80	20	100	4
4	CS3C15	Web Technology	3	1	3	----	80	20	100	3
5	CS3E08-E14	Elective 2	3	1	3	----	80	20	100	4
6	CS3C16	Practical 3	10	5	---	3	80	20	100	3
7	CS3C17	Term Paper	2	2	----	----	---	50	50	1
	Total		27	12	-	-	-	-	650	22

Elective 2	Credit
CS3E08 - Digital Image Processing	4
CS3E09 - Soft Computing Techniques	4
CS3E10 - Wireless and Sensor Networks	4
CS3E11 - Cryptography and Network Security	4
CS3E12 - Data Warehousing and Data Mining	4
CS3E13 - Information Retrieval Systems	4
CS3E14 - Remote Sensing and GIS	4

Semester 4

Sl. No	Course Code	Course	Instructional Hrs/week		Exam Duration		Marks			Credit
			Lect. / Lab	Tutorial	Theory	Practical	ESA	CA	Total	
1	CS4C18	Software Engineering	3	1	3	---	80	20	100	4
2	CS4E15-22	Elective 4	3	1	3	----	80	20	100	4
			Duration of the Project				Viva voce	CA	Total	
3	CS3C19	Project Work & Viva	16 Weeks				300	100	400	8
	Total		6	2	-	-	-	-	600	16

Elective 4	Credit
CS4E15 - Pattern Recognition	4
CS4E16 - Natural Language Processing	4
CS4E17 - Bio Informatics	4
CS4E18 - Mobile Communication	4
CS4E19 - Semantic Web Technology	4
CS4E20 - Virtualization and Cloud Computing	4
CS4E21 - Storage Area Network	4
CS4E22 - Software Development for Portable Devices	4
CS4E23 - Fundamentals of Big Data	4

UNIVERSITY OF CALICUT

Department of Computer Science

M.Sc. Computer Science

Under CCSS (with effect from 2014 Admission)

SYLLABUS

CS1C01 - DISCRETE MATHEMATICAL STRUCTURES

Unit - I

Prepositional Logic: Statement Formulas and Truth Tables, Well Formed Formulas- Tautologies – Equivalence of Formulas – Duality Law- Tautological Implications- Normal Forms, Theory of Inference for the Statement Calculus. Predicate Calculus, Quantifiers, Free and Bound Variables, Inference Theory of the Predicate Calculus.

Unit - II

Set Theory- Sets and subsets - Set operations and their properties - Cartesian Products, Relations – Relation matrices – Properties of relations - Composition of relations, Equivalence relations and partitions – Partial Ordering.

Unit - III

Functions and Relations: Functions – Types of Functions, Composition of Functions and Inverse Functions. Relations - Relations and Their Properties, Functions as relations, Closure of Relations, Composition of relations, Equivalence Relations and Partitions. Partial Ordering, Hasse Diagram. The Pigeon hole Principle.

Unit - IV

Group Theory - Definition and Elementary Properties- Cyclic Groups- Homomorphism and Isomorphism - Subgroups- Cosets and Lagrange's Theorem, Rings and Fields - Definitions and examples of Rings, Integral Domains and Fields

Unit - V

Graph Theory - Paths and Cycles, Graph Isomorphism, Bipartite Graphs, Subgraphs, Representation of Graphs, Eulerian and Hamiltonian Properties of Paths – Trees – Spanning Trees, Cayley's theorem, Kruskal's Algorithm, Prim's Algorithm. Dijkstra's Algorithm to Find Shortest Path in Weighted Graphs.

REFERENCES:

1. Trembley J.P. & Manohar R.P, *Discrete Mathematical Structures with Application to Computer Science*, Mc.Graw Hill, 2007
2. R.P.Grimaldi, *Discrete and Combinatorial Mathematics: An applied Introduction*, 3/e, Addision-Wesley, New Delhi, 1994
3. J.K.Truss, *Discrete Mathematics for Computer Scientists*, Addison Wesley, 1999
4. B.Kolman and R.C.Busby, *Discrete Mathematical Structures for Computer Science*, PHI, 1994
5. C.L.Liu. *Elements of Discrete Mathematics*, 2/e, McGraw Hill, 1985
6. John O. Clark , Derek A. Holton, *A First Look at Graph Theory*, world scientific publishing, 1995.

CS1C02 - ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit - I

Overview of Data Structures, Data Abstraction & Abstract data types. Arrays – Records - Representation. Data Structure operations: Traversing, Inserting and deleting, sorting and searching. Linear Search & Binary Search – Complexity.

Unit - II

Linear Data structures: Stack-operations and its implementations - Parsing arithmetic expressions, translating and evaluating; Recursion-characteristics of recursion-comparison of recursive and non-recursive algorithms, Queue - operations and its implementations – Circular queue – dequeue - priority queues, Linked Lists – Operations and implementations - Doubly Linked Lists and Circular lists - Sparse matrix representation.

Unit - III

Non-linear Data Structures: Trees - Tree traversals algorithms - Binary Tress - Threaded Binary Trees – Binary search Trees - Traversals and operations on BST - balanced trees –AVL, Red-Black Trees, Splay Tree, B-Tree, M-way Trees –Operations and their implementation.

Unit - IV

Hashing: Overview of hashing – Hash tables – hash functions and their computations –open addressing – Linear probing - quadratic probing - double hashing algorithms and their implementations - Separate chaining - Hashing efficiency.

Unit - V

Heap: Overview of heaps-Implementation and operations. Sorting techniques: Insertion sort - Selection sort - Shell sort - Bubble sort - Quick sort – Heap sort - Merge sort - External sort - Comparison of sorting algorithms. Graphs - representation of graphs - operations - traversals and their implementation- minimum spanning trees - shortest path problem - Efficiency of various graph algorithms.

REFERENCES:

1. Alfred V.Aho, John E.Hopcroft and Jeffrey D.Ullman, *Data structures and Algorithms*,Pearson Education Asia,2002.
2. Horowitz E &Sahni S, *Fundamentals of data structures*, Computer Science press, 1978.
3. SartajSahni, *Datastructures, Algorithms and Applications in Java*, Second Edition, Universities Press(India) Pvt Ltd, 2005.
4. Robert Lafore, *Datastructures and algorithms in Java*, Second Edition, Sams Publishing,2003.
5. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, *Introduction toAlgorithms*,Third Edition, PHI,2010.
6. Seymour Lipschutz and GAV Pai, *Data Structures*, Indian Adapted Edition, Schaum'sOutlines Series, TMH, 2006

CS1C03 - PRINCIPLES OF PROGRAMMING METHODOLOGY

Unit - I

Problem Solving – Flow Chart for Structured Programming – Program Charts – System Charts – Variables, data names, programming statements – Flow Chart Symbols – Terminal Symbols – I/O – Comments – Connectors – Process – Decision. Algorithm Design – Problem Solving Aspect – Top Down Design – Formal Conventions – Writing Algorithms – Fundamental Algorithms with flow chart. Program - Characteristics of a good program - Modular Approach - Programming style - Documentation and Program Maintenance - Compilers and Interpreters - Running and Debugging Programs - Syntax Errors - Run-Time Errors - Logical Errors - Concept of Structured Programming.

Unit – II

C Language preliminaries - C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants. Input-Output- getchar, putchar, scanf, printf, gets, puts, functions. Pre-processor directives. Operators and expressions- Arithmetic, unary, logical, bit-wise, assignment and conditional operators. Control statements - While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements, comma operators. Storage types -Automatic, external, register and static variables.

Unit – III

Functions -Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static functions. Arrays - Defining and processing, Passing arrays to a function, Multi-dimensional arrays. Strings -Defining and operations on strings.

Unit - IV

Pointers - Declarations, Passing pointers to a function, Operations on pointers, Pointer Arithmetic, Pointers and arrays, Arrays of pointers function pointers. Structures - Defining and processing, Passing to a function, Unions, typedef, array of structure, and pointer to structure.

Unit - V

File structures - Definitions, concept of record, file operations: Storing, creating, retrieving, updating Sequential, relative, indexed and random access mode, Files with binary mode(Low level), performance of Sequential Files, Direct mapping techniques: Absolute, relative and indexed sequential files (ISAM) concept of index, levels of index, overflow handling. File Handling - File operation: creation, copy, delete, update, text file, binary file.

REFERENCES:

1. Martin M. Lipschutz and Seymour Lipschutz, *Schaum's Outline of Theory and Problems of Data Processing*.
2. Anil Bikas Chaudhuri, *The Art Of Programming Through Flowcharts & Algorithms,* Laxmi Publications, New Delhi.
3. Jean Paul Trembley and Pual G Sorenson, *An Introduction to Data Structures with Applications,* Tata McGraw Hill.

CS1C04 - THEORY OF COMPUTATION

Unit - I

Preliminaries: Review of proof techniques - Mathematical induction - Basic concepts of languages automata and grammar– Alphabet, languages and grammars, productions and derivation. Regular languages: Regular expressions - Finite deterministic and non-deterministic automata – regular grammar. Equivalence between various models. Closure properties regular languages – DFA state minimization – Pumping lemma and proof for existence of non regular languages.

Unit - II

Context-Free Grammars (CFG) – Derivations – sentential forms – Parse tree - Ambiguity in grammars and Languages - Applications of CFG – Simplification of Context free Grammars – Normal forms: Chomsky Normal form (CNF) and Greibach Normal form (GNF).

Unit - III

Pushdown Automata (PDA) – Formal definition – Graphical notations - Language accepted by PDA – Deterministic and Non Deterministic PDA - Equivalence of PDAs and CFGs –Pumping lemma for CFLs, Closure properties of CFLs - Decision properties of CFL. Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Unit – IV

Turing Machines – Notation – Instantaneous Description – Transition Diagram – The language of a Turing Machine – Variants of TMs – Multitape TMs, Nondeterministic TMs. -TMs with semi - infinite tapes, multistack machines - Universal Turing Machines-Equivalence of the various variants with the basic model - Church-Turing Thesis.

Unit – V

Computability – Closure properties of recursive and recursively enumerable language. Context Sensitive Language and LBA – Equivalence of LBA and CSG. – The Chomsky Hierarchy Un-decidability - Halting problem – reductions – Complexity: Complexity Classes - Class P - Class NP – NP complete and NP Hard problems.

REFERENCES:

1. Linz: P. An Introduction to Formal Languages and Automata, Narosa, 1998.
2. HoporoftJ.E.and Ullman J.D., Introduction to Automata Theory Languages and Computation, Narosa, 1998.
3. H.R.Lewis and C.H.Papadimitriou, Elements of the Theory of Computation, Prentice Hall of India, 1996.
4. Martin J.C., Introduction to Languages and the Theory of Computation, Tata McTraw Hill, 1997.
5. J.E.Sagage, Models of Computation, exploring the power of Computing, Addison Wesley, 1998.
6. Michael Sipser : Introduction to theory of Computation , Cenage Learning, Indian Edition
7. D. S. Garey and G. Johnson, Computers and Intractability: A Guide to the Theory of NP-Completeness, Freeman, New York, 1979.

CS1C05 - COMPUTER ORGANIZATION AND ARCHITECTURE

Unit - I

Digital Computers and Digital Systems, Number systems and Conversions, Digital Logic Circuits-Boolean Algebra & Map simplification, combinational circuits, flip flops, design of sequential circuits, Digital Components-Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, data representation - data types, complements, fixed-point representation, floating-point representation, other binary codes, error detection codes.

Unit – II

Computer Arithmetic**:** addition of positive numbers, design of fast adders, signed addition and subtraction, Arithmetic and Branching Conditions, Multiplication of positive numbers, signed number multiplication –Booth Algorithm, fast multiplication, division-restoring and non-restoring algorithms, floating point numbers and operations-single & double precision.

Unit – III

Basic computer organization – machine instructions – classification, function, addresses, size, addressing modes – instruction cycle - instruction sequencing. fundamental concepts – registers, register transfers, performing arithmetic or logic operations, memory read and write, execution of a complete instruction, branch instruction, Single bus, two bus, three bus organization, a complete processor – Control unit: - hardwired control, microprogrammed control, micro instructions-types.

Unit IV

The Memory System: Some Basic Concepts, Semiconductor RAM Memories, Read – Only Memories, Speed, Size and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage, memory interleaving. Input / Output Organization -Accessing I/O devices – programmed I/O, interrupt I/O - interrupts - interrupt processing – hardware interrupts – programmable interrupt controller – vectored interrupts - interrupt nesting - daisy chaining – direct memory access (DMA) - DMA operations & DMA Controller, Introduction to I/O interfaces, I/O channels, IO Processors.

Unit V

8085 microprocessor - Architecture: Block diagram-addressing modes-instruction set, Instruction cycle-timing diagrams - different machine cycles - fetch and execute operations - estimation of execution time. 8086 microprocessor - Architecture: Block diagram-Intel 8051 Micro controller – Architecture - basic instructions-basic assembly language programs- peripherals: interrupts, timers, parallel port, serial port.

REFERENCES:

1. V C Hamacher, Computer Organization, Mc-Graw Hill International Edition, Fifth Edition.
2. Morris Mano, Digital logic and Computer design, Prentice Hall of India, 2004.
3. M Morris Mano, Computer System Architecture, Prentice Hall, Third Edition.
4. William Stallings, Computer Organization and Architecture, Fifth Edition.
5. Andrew S Tanenbaum, Structured Computer Education, Prentice Hall, Fourth Edition.
6. Floyd and Jain, Digital Fundamentals, Pearson Education, Eighth Edition.
7. Ramesh. S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, Wiley Eastern Ltd, New Delhi.

CS1C06 – PRACTICAL -1

Unit – 1 C Programming

Develop programs to implement the following:

1. HCF (Euclid's algorithm) and LCM of given numbers.
2. Find mean, median and mode of a given set of numbers
3. Conversion of numbers from binary to decimal, hexadecimal, octal and back.
4. Evaluation of functions like ex, sinx, cosx etc. for a given numerical precision using Taylor's series.
5. Testing whether a given number is prime.
6. String manipulation programs: sub-string search, deletion.
7. Lexicographic sorting of a given set of strings.
8. Generation of all permutations of the letters of a given string using recursion.
9. Programs to find the product of two matrices.
10. Inverse and determinant (using recursion) of a given matrix.
11. Files: Use of files for storing records with provision for insertion, deletion, search, sort and update of a record.

Unit-II:

Data Structures and Algorithms

Implement the following:

1. Singly linked list with operations to access data, add node and delete node.
2. Variations on linked lists.
3. Sparse matrix.
4. PUSH, POP operations of stack using Arrays/using linked lists.
6. Add, delete operations of a queue using Arrays.
7. Add, delete operations of a queue using linked lists.
8. Variations on queues.
9. Conversion of infix to postfix using stack operations.
10. Postfix Expression Evaluation using stack.
11. Towers of Hanoi Problem
12. Addition of two polynomials using linked list.
13. Binary tree using linked lists
14. Binary tree traversals.
15. Variations on tree structures
16. Graphs/Graph traversals
17. Shortest path algorithm
19. Sorting techniques/Search algorithms.

CS2C07 - DESIGN AND ANALYSIS OF ALGORITHMS

Unit - I

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Master's theorem. Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.

Unit - II

Divide-and-Conquer: Mergesort, Quicksort, Binary Search, Stressen's Matrix Multiplication, Binary tree Traversals and related properties, median finding algorithm. Decrease-and-Conquer: Insertion Sort, Depth First and Breadth First Search, Topological sorting,

Unit - III

Transform-and-Conquer: Introduction, Balanced Search Trees: AVL Trees, 2-3 Trees, Heaps and Heapsort. Greedy Method: The General Method, Huffman coding, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Paths.

Unit - IV

Dynamic Programming: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, 0/1 Knapsack, The Traveling Salesperson problem. Backtracking: n-Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem.

Unit - V

Complexity: Complexity classes – P, NP, Co-NP-Hard and NP-complete Problems – Cook's theorem – NP-completeness reductions for clique, vertex cover, subset sum, Hamiltonian cycle, TSP, Integer programming Approximation algorithms – vertex cover, TSP, set covering and subset sum.

REFERENCES:

1. Anany Levitin: Introduction to the Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.
2. Thomas H Cormen, Charles E Leiserson, & Ronald L Rivest, *Introduction to Algorithms*, 2nd Ed. Prentice Hall of India Private Limited, New Delhi, 2001.
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.
4. S. Basse, *Computer Algorithms: Introduction to Design and Analysis*, Addison Wesley, 1998.
5. U.Manber, *Introduction to Algorithms: A creative approach*, Addison Wesley, 1989
6. V.Aho, J.E. Hoperaft, J.D.Ullman, *The design and Analysis or Computer Algorithms*, Addison Wesley, 1974
7. Gilles Brassard & Paul Bratley, *Fundamentals of Algorithmics*, Prentice-Hall of India, 2007.
8. Goodman S E & Hedetnieni, *Introduction to the Design & analysis of Algorithms*, Mc- Graw Hill, 2002.

CS2C08- ADVANCED DATABASE MANAGEMENT SYSTEM

Unit - I

Database System Concepts, Purpose of Database Systems, Views of Data –Data Abstraction, Instances and Schemas, Data Independence, Data Models. Relational Data Model-Relational Model concepts, keys, Integrity constraints--Domain Constraints, Key Constraints, Entity Integrity Constraints , Referential Integrity Constraints. ER Data Model- Design Issues, Entity Relationship Diagram, Weak Entity Sets, Extended ER Features, Design of an ER Database Schema, Reduction of an ER Schema to Tables. Relational Algebra-Selection and Projection, Set operations, Renaming, Joins, Division. Relational Calculus.

Unit - II

Relational database design – Design Principles, Normalization, Normal Forms -1NF, 2NF, 3NF, BCNF, 4NF & PJNF, Domain Key Normal Form. Transactions -concepts, states of Transactions, ACID properties. Schedules - serial schedules, concurrent schedules, Serializability, Concurrency control protocols- Locking-Two-Phase Locking, Deadlock, Granularity, Timestamp Ordering Protocol.

Unit – III

Relational Database Query Languages - Basics of QBE , SQL –Data Definition Language(DDL), Data Manipulation Language(DML), Data Control Language(DCL) Commands, Basics of Query Processing. Data Definition in SQL - Data types, Creation, Insertion, Viewing, Updation, Deletion of tables, Renaming, Dropping of tables. Data Constraints – I/O constraints, Primary key, foreign key, unique key constraints, Database Manipulation in SQL - Select command, Logical operators, Range searching, Pattern matching, Grouping data from tables in SQL, GROUP BY, HAVING clauses, Joins. Views - Creation, Renaming the column of a view, DROP view.

Unit - IV

Program with SQL - Data types: Using set and select commands, Flow control constructs - if, if /else, while, goto. Global variables, Data types, Operators and Functions, Data Definition and Manipulation Statements, CodeBlocks, Stored Procedures- create, alter and drop, passing and returning data to stored procedures, using stored procedures within queries. Cursors -Working with cursors, Error Handling. User defined functions, implementing triggers.

Unit - V

Distributed Database systems- characteristics, architecture and challenges. Different approaches in database technologies - Object oriented and Object relational databases. Emerging trends in databases. Introduction to Big Data.

REFERENCES:

1.AbrahamSilbersehatz, Henry F. Korth and S.Sudarshan, *Database system concepts*,6th Edition, Tata McGraw-Hill 2010.
2.Elmasri and Navathe, *Fundementals of Database systems*, 5th Edition, Pearson, 2009.
3.CJ Date, Introduction to Database Systems, Addison Wesley.
4.Ramakrishnan and Gehrke, *Database Management Systems*, 3rd Edn, Mc Graw-Hill, 2003
5.VikramVaswani, *MySQL The complete Reference*,1st Edition, Tata McGraw-Hill, 2004.
6.Paul DuBois, *MySQL Cookbook*, 2nd Edition, O'Reilly Media, 2006

CS2C09 - OPERATING SYSTEM CONCEPTS

Unit - I

System software Overview: Operating system, I/O Manager, Assembler, Macro Processor Compiler and Interpreters, Linker, Loader. Fundamentals of OS**:** OS services and components, Different types of operating systems, multitasking, multiprogramming, time sharing, buffering, spooling.

Unit - II

Process & thread management: Concept of process and threads, process states, process management, context switching, interaction between processes and OS, multithreading. CPU Scheduling algorithms, Concurrency control: Concurrency and race conditions, mutual exclusion requirements , s/w and h/w solutions, semaphores, monitors ,classical IPC problem and solutions , Dead locks -characterization , detection ,recovery, avoidance and prevention.

Unit - III

Memory management: Issues-Memory Allocation, Dynamic Relocation, various management strategies. Virtual memory, Paging: Issues and Algorithms. Segmentation: Typical implementations of paging and segmentation systems, Disk Scheduling. File Systems: File concept, File support, Access methods, Allocation methods, Directory systems, File Protection, Free Space management.

Unit - IV

Protection & security-Protection: Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights .Security: the security problem, authentication, one-time passwords, program threats, System threats, Threat monitoring, Encryption. Case study of Microsoft Windows XP.

Unit – V

UNIX Operating System- UNIX Software architecture- Kernel, System calls, UNIX Command lines, Basic UNIX Commands, File System, Basics of UNIX Shell programming.

REFERENCES:

1. D. M. Dhamdhare*, Operating Systems*, Tata Mc Graw Hill, 2nd Ed.
2. Silberschatz& Galvin, *Operating System Concepts*, Wiley, 7th Ed.,2000.
3. Gary J Nutt, *Operating systems-A Modern Perspective*, Addison Wesley,2000.
4. Flynn &Metioes*, Understanding Operating System*, Thomsan, 4th Ed.
5. Andrew Tanenbam, Albert S. Woodhull, *Operating Systems Design & Implementation*, Pearson.
6. Achyut S. Godbole, Operating Systems, Tata Mc Graw Hill 2nd Ed.
7. UNIX Operating System: The Development Tutorial via UNIX Kernel Services, YukunLiu, Yong Yue, LiweiGuo

CS2C10- OBJECT ORIENTED PROGRAMMING WITH JAVA

Unit – I

Introduction to Object Oriented Programming, Comparison with other programming paradigms, Java Basics: Java Programming environment, Structure of a java program, Life cycle of a java program, Java Virtual Machine, Byte code, Features of Java, fundamental programming structures in Java: comments, Primitive Data Types ,variables, Keywords, literals, variables scope & declarations, Control structures, Operators - Casts and Conversions, Arrays. Simple programs.

Unit - II

Data abstraction and Encapsulation - Objects and Classes: Predefined Classes - Defining Classes- Static Fields and Methods - Method Parameters – Object Construction- Packages. Inheritance: Classes - Super classes – Subclasses - Object: The Cosmic Superclass - Generic Array Lists -Object Wrappers and Auto-boxing – Reflection - Enumeration Classes. Interfaces and Inner Classes, Polymorphism: Overloading – Overriding.

Unit – III

Introduction to GUI: AWT Architecture - Light-Weight vs Heavy-Weight, AWT Event Hierarchy & Event Handling - Using Top-Levels – components and containers - Introduction to Layouts. Deploying Applets and Applications: Applet Basics - The Applet HTML Tags and Attributes – Multimedia - The Applet Context - JAR Files - Application Packaging.

Unit - IV

Exceptions and Debugging: Dealing with Errors - Catching Exceptions - Using Exceptions, user defined Exceptions. Threads - Creating Threads, Runnable interface, Thread Class, Inter thread communication, Synchronization suspending, resuming and stopping threads. Multithreaded Programming. Streams and Files: The Complete Stream - ZIP File Streams – Use of Streams – Object Streams - File Management.

Unit - V

User Interface Components with Swing: Introduction to Layout Management - Text Input Choice Components – Menus - Sophisticated Layout Management - Dialog Boxes. Java library. Database Programming: JDBC - introduction, architecture, Drivers, connections, statements, resultset, Meta data and Query Execution. Sockets: Introduction to networking, InetAddress, url, socket, server sockets, Datagrams.

REFERENCES:

1. Horstmann&Coronell, “Core Java “, Volume 1 and 2, 8th Ed., Pearson, 2008.
2. Herbert Schildt, “Java2 The Complete Reference”, Seventh Edition, Tata McGraw-Hill,2007.
3. Bruce Eckel, “Thinking in Java”, Prentice Hall, Fourth Edition, 2006.
4. Kathy Sierra and Bert Bates, “Head first java”, Second Edition, Oreilly Media, 2005.
5. Y.Daniel Liang, “Introduction to Java Programming”, Eighth Edition, Pearson, 2011.
6. James. P. Cohoon, Jack. W. Davison, “Programming in java 5.0”, Tata McGraw Hill, 2006.
7. Thomas Wu, “An introduction to Object Oriented Programming with Java”, Tata McGraw Hill, 2006.
8. Bernard Van Haecke,”JDBC: Java Database Connectivity”, IDG Books India, 2000.
9. E Balaguruswamy, Programming in Java.

CS2C11 – PRACTICAL -2

Unit – 1

Java Programming

Develop programs to implement the following.

1. Classes, objects and methods.
2. Inheritance of different types.
3. Use of keywords super, abstract and final.
4. Method overloading and Method overriding
5. Packages and interfaces.
6. Exception handling
7. Use of static members in a class.
8. File operations.
9. Multithreaded Programming
10. Applets
11. String handling
12. AWT to work with text and graphics
13. Applications of Swing.

Unit-1I

Advanced DBMS

1. DCL, DDL, DML, DQL statements in MySQL
1. Stored Procedures in MySQL
2. Cursors and Triggers
3. Transactional and Locking statements
4. Account Management statements

CS2E01 – ARTIFICIAL INTELLIGENCE

Unit – I

Introduction: Artificial Intelligence- problems, scope and applications, Problem space and search- Production system- characteristics- the predicate calculus, Inference rules, Structures and strategies for state space search, strategies for space search, using state space to represent reasoning with the predicate calculus.

Unit – II

Heuristics Search: Control and implementation of state space search, Generate and test, Hill climbing, Depth first search, Breadth first search, Best–first search, A*, Problem Reduction, AO*, Constraint Satisfaction, Means-ends analysis, Heuristic in games, Complexity issues.

Unit – III

Game Playing – The Minimax search procedure, adding Alpha-beta cutoffs, Additional refinement, Iterative deepening, Planning system and its components, Understanding, Understanding as constrained satisfaction.

Unit – IV

Knowledge representation issues, representation and mappings, Representing simple facts in logic, Representing instances and ISA relationships, Computable functions and Predicates, Resolution, conversion to clausal form, Unification algorithm, Natural deduction.

Knowledge representation using rules, logic programming, forward versus backward reasoning, Symbolic reasoning under uncertainty- Nonmonotonic reasoning, Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts.

Unit – V

Machine Learning – rote learning, learning by taking advice, learning in problem solving, learning from examples, Explanation based learning, Analogy, formal learning theory, Connectionist models- Hopfiled networks, learning in neural networks, back propagation, applications of neural networks, Genetic algorithm, classifier systems and genetic programming, artificial life and society based learning.

REFERENCES:

1. E. Rich, K. Knight and S.B.Nair, *Artificial Intelligence*, 3rd Edn. TMGH, New Delhi, 2009.
2. G.F. Luger and W.A Stubblefield, *Artificial Intelligence – Structures and Strategies for complex problem solving*, Addison-Wesley-1998.
3. P.H Winston – *Artificial Intelligence,* Addison-Wesley-1992.
4. Nils J. Nilsson ,*Artificial Intelligence* , A New Synthesis, Morgan Kauf 2000.
5. W.F. *Clocksin* and C.S. *Mellish*, Springer Verlag, *Programming in Prolog* 2003
6. *Dan W.Patterson* , Introduction to Artificial Intelligence and Expert Systems, Prentice Hall, 1990

CS2E02 – INFORMATION THEORY AND CODING

Unit – I

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

Unit – II

Waveform Coding Techniques: PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for Data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization

Unit – III

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

Unit – IV

Digital Modulation Techniques: Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signaling.

Unit – V

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

REFERENCES:

1. J. Dass. , S.K. Malik & P.K. Chatterjee, *Principles of digitals communication*:1991.
2. Vera Pless, *Introduction to the theory of Error correcting codes*: John Wiley & Sons, Inc.1998
3. Robert G. Gallanger, *Information Theory and Reliable Communication*: Mc Graw Hill, 1992
4. Simon Haykin :*Digital communications* – John Willy & sons, 2003.

CS2E03 – COMPUTER GRAPHICS

Unit-I

Introduction, application and output devices for computer graphics: raster and random scan display, CRT, color CRT, flat panel, LCD, LED, DVST. Adapters; monochrome display adapter (MDA), CGA, hercules graphics card, enhanced graphics adapter, Professional graphics adapter, VGA, SVGA. Graphics software: GKS, PHIGS, OpenGL. Scan conversion: Points & lines, line drawing algorithms; DDA algorithm, Bresenham's line algorithm Circle generation algorithm Mid - Point Circle algorithm, Ellipse generating.

Unit-II

Filling, Clipping & Transformation (2D&3D): Area scan conversion, seed fill algorithm ,scan line polygon fill algorithm ,Inside Outside test, Boundary fill algorithm ,Flood fill algorithm, Character generation. Anti-aliasing. Clipping operations, Cohen Sutherland line clipping, Liang Barsky line clipping, Nicholl Lee line clipping, polygon clipping, Sutherland Hodgeman & Weiler Atherton polygon clipping, Text clipping. Transformation: Geometric & coordinate transformation, Inverse transformation, Composite transformation, Translation, rotation, scaling, shearing, reflection.

Unit-III

Projection: 3D concepts & viewing pipeline, coordinate system, window to viewport coordinate Transformation, parallel & perspective projection, projection matrix, view volume. 3D object representation: wireframe model, visible surface detection methods, depth comparison, Z-buffer algorithm, back face detection, BSP tree method, printer's algorithm, depth cueing.

Unit-IV

Curves & Fractals: curve representation, surfaces, designs, spline representation, Bezier curves, cubic spline, beta spline, B-spline curves. Fractal's geometry, fractal generation procedure, classification of fractal, fractal dimension, fractal construction methods.

Unit-V

Color & shading Models: Introduction, modelling light intensities and sources ,diffuse reflection, Lambert's cosine law, specular reflection, half-toning, dithering, color model - XYZ,RGB,YIQ,CMY & HSV, shading algorithm & model, illumination model, gouraud shading, phong shading. OpenGL programming: Introduction, primitives drawing, colouring, transformation, filling, curve.

REFERENCES:

1. Donald Hearn and M. Pauline Baker, *Computer Graphics*, Prentice Hall, 1997
2. D.Hearn and M. P. Baker, Computer Graphics with Open GL, 3rd Ed., Prentice Hall, 2004.
3. FS Hill, JR, *Computer Graphics using OpenG,L,* Second Edition, Prentice Hall of India Private Ltd.-New Delhi, 2005
4. Dave, Mason Woo, Jackie, Tom Davis, *Open GL Programming Guide*, 6th Edition, Person

CS2E04 - ADVANCED MICRO PROCESSORS AND MICRO CONTROLLER

Unit - I

8085 microprocessor - Architecture: Block diagram-addressing modes-instruction set-basic programs- stacks and subroutines-interrupts-machine cycles-time delays.

Unit -II

8086 microprocessor - Architecture: Block diagram-real mode memory addressing-addressing modes: data addressing, program memory, addressing, stack memory addressing-instructions: data movement instructions, arithmetic logic instructions, program control instructions-basic programs-procedures.

Unit -III

Interrupts-types 8086 interrupts and interrupt responses-interrupt vector table-8259 PIC-interrupt applications: INT 09H and keyboard buffer-INT 21Hoperations for screen display and keyboard input- INT10Hand 16H operations for video and keyboard.

Unit -IV

Peripherals-memory interface-8255PPI-8254 PIT-8237 DMA controller-8279 keyboard and display controllers.

Unit- V

Intel 8051 Micro controller-Architecture-basic instructions-basic assembly language programs- peripherals: interrupts, timers, parallel port, serial port.

REFERENCES:

1. Ramesh S.Gaonkar, *Microprocessor architecture, programming and applications with the 8085*,, PenRam International Edition.
2. Barry.B.Bray, *The Intel microprocessors-architecture, Programming &interfacing*,, PHI Edition.
3. Peter Abel, *IBM PC assembly language & Programming*, PHI Edition.
4. Muhammed Ali Mazidi, Janice GillisPie Mazidi, Rolin D.McKinlay, *The 8051 micro controller and embedded systems,*
5. Douglas V.Hall, *Micro processors and interfacing, Programming and Hardware*, TMH Edition.
6. Kenneth J.Ayala, *The 8051 micro controller-Architecture, Programming and Applications*, PRI Edition.

CS2E05- NUMERICAL AND STATISTICAL METHODS

Unit I

Approximation and errors in computing - introduction, significant digits - inherent errors – numerical error - modeling errors - blunders - absolute and relative errors - conditioning and stability. Roots of non-linear equations - introduction - iterative methods – bisection - false position – Newton - Raphson's, Secant and Bairstow's methods.

Unit II

Introduction solution of linear equations - Gauss elimination - Gauss-Jordan method - Jacobi Iteration method - Gauss-Seidal methods. Interpolation - linear interpolation - Newton's forward backward & divided difference interpolation methods – Lagrange's method.

Unit III

Integration - trapezoidal rule, Simpson's 1/3, & 3/8 rules. Differential equations: Heunn's polygon, Range-Kutta fourth order, Milne-Simpson, Adams-Bashforth and Adams-Moulton methods.

Unit IV

Classical definition of probability – statistical definition of probability – axiomatic approach to probability – addition and multiplication theorem on probability - compound and conditional probability – independence of events – Bayes theorem random variables – discrete and continues – pmf, pdf and distribution functions.

Unit V

Introduction linear programming – mathematical formulation – graphical method of solution – simplex method – duality – dual simplex – transportation – assignment problems.

REFERENCES:

1. E. Balagurusamy, *Numerical Methods*, 1st Edition, Tata Mcgraw Hill Education Private Limited, ISBN: 0074633112.
2. S.G. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 11th Edition, Sultan Chand & Sons , ISBN: 9788180545283.
3. V.Rajaraman, *Computer Oriented Numerical Methods*, 3rd Edition, Prentice Hall Of India, ISBN: 81203078601993.
4. Satyendra Mittal and C. P. Sethi, *Linear Programming,* Pragati Prakashan.

CS2E06 – DISTRIBUTED COMPUTING

Unit – I

Operating system fundamentals - distributed system concepts and architectures - major design issues - distributed computing environments (DCE).

Unit – II

Concurrent processes and programming - threads and processes - client server model – time services language mechanisms for synchronization - concurrent programming languages.

Unit – III

Inter-process communication and coordination - message passing communication - request/reply communication - transaction communication -name and directory services - distributed mutual exclusion - leader election.

Unit – IV

Distributed process scheduling - static process scheduling, dynamic load sharing and balancing – distributed process implementation.

Unit – V

Real-time scheduling - concepts of distributed file systems - distributed shared memory - distributed computer security

REFERENCES:

1. Chow R. & Johnson T, *Distributed Operating Systems and Algorithms*, Addison Wesley.
2. Sinha P.K., *Distributed Operating Systems Concepts and Design*, PHI
3. Tanenbaum S. *Distributed Operating Systems*, Pearson Education.
4. Coulouris G, Dollimore J. & Kindberg T., *DistributedSystems Concepts and Design*, Addison Wesley
5. Singhal M. & Shivaratri, *Advanced Concepts in Operating Systems, Distributed Databases And Multiprocessor Operating Systems*, McGraw Hill.

CS2E07– SIMULATION AND MODELING

Unit – I

Introduction - systems and models - computer simulation and its applications -continuous system simulation - modeling continuous systems - simulation of continuous systems - discrete system simulation - methodology – event scheduling and process interaction approaches - random number generation.

Unit – II

Testing of randomness - generation of stochastic variates - random samples from continuous distributions – uniform distribution - exponential distribution m-Erlang distribution – gamma distribution - normal distribution – beta distribution - random samples from discrete distributions Bernoulli - discrete uniform -binomial - geometric and poisson.

Unit – III

Evaluation of simulation experiments - verification and validation of simulation experiments – statistical reliability in evaluating simulation experiments -confidence intervals for terminating simulation runs - simulation languages -programming considerations - general features of GPSS-SIM SCRIPT and SIMULA.

Unit – IV

Simulation of queueing systems - parameters of queue - formulation of queueing problems - generation of arrival pattern - generation of service patterns -Simulation of single server queues - simulation of multi-server queues -simulation of random queues.

Unit – V

Simulation of stochastic network - simulation of PERT network - definition of network diagrams forward pass computation - simulation of forward pass -backward pass computations - simulation of backward pass - determination of float and slack times determination of critical path - simulation of complete network - merits of simulation of stochastic networks.

REFERENCES:

1. C. Deo N., *System Simulation And Digital Computer*, Prentice Hall of India.
2. Gordan G., *System Simulation*, Prentice Hall of India.
3. Law A.M. & Ketton W.D., *Simulation Modelling and Analysis*, McGraw Hill.

CS3C12 - ADVANCED JAVA PROGRAMMING

Unit- I

Java Database connectivity- JDBC Architecture- Drivers- Database connections-Statements-Result sets-Transactions metadata- stored procedures-error handling-BLOBs and CLOBS.

JNDI- Architecture-context-initial context class-Object in a context –listing the children of a context-binding objects –accessing directory services-X.500 directories-Dir context interface-Attributes and attribute interface--creating directory entities and searching.

Unit -II

RMI -Architecture- Defining remote Objects-Creating stubs & skeletons –Seializable classes-Accessing Remote Objects-factory classes-Dynamically loaded classes-RMI activation-Registering remote objects-marshalling and unmarshalling.

Unit -III

CORBA –Architecture-Services-IDL-ORB-Naming service-Inter-ORB Communication-creating CORBA objects-simple server class-helper class-holder class-stubs and skeletons-registering with naming services- finding remote object-adding object to naming context-Using naming context. Different models for CORBA server/clients and their implementations.

Unit -IV

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

Unit -V

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

REFECENCES:

1.David Flanagan,Jim Farley, William Crawford & Kris Magnusson , *Java Enterprise in a nutshell-A desktop Quick reference*, O'REILLY Media, 2003.

2. Stephen Ausbury and Scott R. Weiner, *Developing Java Enterprise Applications*, Wiley India, 2001.
3. Jaison Hunder & William Crawford, *Java Servlet Programming*, O'REILLY Media, 2002.
4. William Gross, *Java RMI*, 1st Edition, O'Reilly Media, 2001.
5. Gerald Brose, Vogel Andreas and Keith Dubby, *Java Programming with CORBA*, 3rd Edition, Wiley India Pvt Ltd, 2009.
6. Ed Roman and Scott Ambler, *Mastering Enterprise Java Beans*, 3rd Edition, Wiley, 2004.

CS3C13-PRINCIPLES OF COMPILER DESIGN

Unit – I

Introduction to compiling : Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools - Lexical Analysis - Role of Lexical Analyzer – Input Buffering – Specification of Tokens.

Unit - II

Syntax analysis : Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing - Recursive Descent Parsing - Predictive Parsing – Bottom-up parsing - Shift Reduce Parsing – Operator Precedent Parsing - LR Parsers - SLR Parser - Canonical LR Parser - LALR Parser.

Unit – III

Intermediate code generation: Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

Unit - IV

Code generation: Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

Unit - V

Code optimization and run time environments : Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

REFERENCES:

1. V Aho A, Ravi Sethi, D Ullman J, *Compilers Principles, Techniques and Tools,* 2nd Edition, Pearson Education Singapore Pte Ltd.
2. K. V. N. Sunitha, *Compiler Construction*, Pearson.
3. W Appel and Andrew, *Modern Compiler Implementation in C*, 1st Edition, Cambridge University Press.
4. Allen I Holub, *Compiler Design in C*, 1st Edition, PHI Learning Pvt Ltd.
5. Tremblay and Sorenson, *The Theory and Practice of Compiler Writing*, 1st Edition, BSP Books Pvt Ltd.
6. Torben Ægidius Mogensen, *Basics of Compiler Design*, Department of Computer Science, University of Copenhagen (Online Edition).

CS3C14–DATACOMMUNICATION AND NETWORKING

Unit-I

Data &signals -Analog and Digital signals, Line configuration, Topology, Transmission mode, Guided and Unguided media, Parallel and Serial data transmission, Layered approaches–OSI and TCP/IP. Multiplexing. Transmission impairments-Distortion, Attenuation, Noise. Analog modulation- AM, PM, FM. Sampling theorem, Analog pulse modulation, Digital pulse modulation. ASK, FSK, PSK and PSK. Digital data transmission & Interface standards. DTE & DCE. Modems.

Unit-II

DataLinkLayers-ErrorDetection&Correction.DataLinkControl-lineDiscipline, flow control, error control .Data link Protocol-synchronous & asynchronous protocol, character oriented & Bit Oriented protocol. Multi Access Protocols- ALOHA and CSMA. Switching. Networking and Internetworking devices-Repeaters, Bridges, Routers &Gateways.

Unit-III

LANs: Project802-Ethernet, token bus, token ring. Bluetooth-architecture, layers, radio layer, baseband layers. L2CAP & upper layers. FDDI. MANs-IEEE802.6. SMDS. Network layer address & protocol- ARP, IP, ICMP, IGMP.IPv4 and IPv6.Subnetting.ISDNlayers and BISDN. X.25layers, packet layers protocol. Frame relay layers. ATM-design topology, protocol, architecture. Routing algorithms.

Unit-IV

SONET/SDH-Configuration, Layers, Frames. Transport Layer- Design Issues, Connection Management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP).Session layer. Presentation layer-Protocols, Compression, Translation. Application layer- Protocols, DNS, Telnet. WWW&HTTP.

Unit-V

Computer Network Security- Introduction, Need for security, Principles of Security, Types of Attacks. Symmetric and Public key algorithms. Authentication. Integrity. Key Distribution and Certification.

REFERENCES:

1. Behrouz A.Forouzan,*DataCommunicationsandNetworking*,FourthEdition,McGrawHill 2001
2. AndrewS.Tanenbaum,*Computer Networks*,FourthEdition,Prentice-Hall,2003
3. WilliamStallings,*DataandComputer Communication*, EighthEdition,Prentice-Hall,2007
4. J. F. Kurose and K. W. Ross, *Computer Networking*: A Top-Down Approach Featuring Internet, Sixth Edition, Perason Education.

CS3C15 - WEB TECHNOLOGY

Unit -I

Introduction to Web programming – Introduction to SGML features – HTML, XHTML, DHTML, XML – HTML Vs XML – Creating XML documents – Parsing an XML document – Writing well formed documents – Organizing elements with namespaces – Defining elements in a DTD – Declaring elements and attributes in a DTD. Familiarization of HTML5 futures and tag set.

Unit -II

Introduction to scripting - server side and client side scripting. CGI/Perl: Creating link to a CGI Script – Using a link to send data to a CGI Script – parsing data sent to a Perl CGI script – Using CGI script to process form data – Using scalar variables in Perl – Using variables in Perl – Using arithmetic operators in Perl - arrays, list, hashes, strings, pattern and regular expressions, text processing, subroutines– Associating a form with a script-

Unit -III

Java Server Pages – JSP scripting elements – Linking to external files – JSP declarations – JSP Expressions – JSP Scriplets – Processing client requests- Accessing a database from JSP. Advantages of JSP comparing with other language.

Unit- IV

PHP: Advanced features of PHP, Defining PHP variables – variable types – operators – control flow constructs in PHP- Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions, GET and POST methods – Establishing connection with MySQL database – managing system data – parsing data between pages

Unit -V

Python: Introduction to Python language, Advantages of Python in comparison with other Languages, Data types, control structures, advanced data structures, I/O, defining classes, data collections, functions and modules (math module), packages, exception handling, standard library, internet programming with python.

REFECENCES:

1. Robert W. Sebesta, Programming with World Wide Web, 4th edition, Pearson Education, 2009.
2. XueBal et. al, The Web Warrior Guide to Web programming, Thomson Learning.
3. Chris Bates, Web Programming: Building Internet Applications, 3rd ed, Wiley Academic Catalog.
4. H.M. Deitel, P.J. Deitel and A.B. Goldberg, Internet and World Wide Web: How to Program, rd edition, Pearson Education.
5. Steven Holzner, PHP The complete Reference,1stEdition,McGraw-Hill, 2007.
6. Philip Hanna, JSP The complete Reference, 2nd Edition, McGraw-Hill, 2002.
7. Paul Barry, Head First Python, 1st Edition, O'Reilly Media, 2010
8. Scott Guelicb, ShishirGundavaram and Gunther Birznieks, CGI Programming with Perl, 2nd Edition,O'Reilly Media, 2000.
9. How to Think Like a Computer Scientist: Learning with Python, Allen Downey , Jeffrey Elkner , Chris Meyers, http://www.greenteapress.com/thinkpython/thinkpython.pdf

CS3E08– DIGITAL IMAGE PROCESSING

Unit – I

Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model – sampling and quantization - basic relationship between pixels - image geometry

Unit – II

Image transforms - introduction to Fourier transform - discrete Fourier transform (DFT) - properties DFT- other separable image transforms - Walsh, Hadamard and Discrete Cosine transforms. Hotelling transform.

Unit – III

Image enhancement - basic grey level transformation - histogram equalization - image subtraction - Image averaging - spatial filtering - smoothing, sharpening filters - Laplacian filters. Enhancement in the frequency domain – frequency domain filters - smoothing, sharpening filters - homomorphic filtering.

Unit – IV

Image restoration - model of Image degradation/restoration process - noise models - inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - Boundary representation

Unit – V

Image compression - fundamental concepts of image compression - compression models - information theoretic perspective. Lossless compression - Huffman coding - arithmetic coding - bit plane coding - run length coding. Lossy compression - transform coding - Image compression standards.

REFERENCES:

1 R.C. Gonzalez and R.E. Woods, *Digital Image Processing – 3rd ed.*, Prentice Hall of India, New Delhi, 2008

2. B. Chanda and D.D. Majumder, *Digital Image Processing and Analysis*, PHI

3. A.K. Jain, *Fundamentals of Digital Image Processing*, PHI

4. W.K. Pratt, *Digital Image Processing*, John Wiley, 2006

5. M. Sonka, V. Hlavac and R. Boyle, *Image Processing Analysis and Machine Vision*, Brooks/colic, Thompson Learning, 1999.

CS3E09 – SOFT COMPUTING TECHNIQUES

Unit – I

Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces – error probabilities and integrals - normal density - discriminant functions for normal density.

Unit – II

Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues – systems

Unit – III

Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Unit – IV

Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Unit – V

Advanced Topics: Support Vector Machines, Evolutionary computation (EC)- Evolutionary algorithms, Harmony search, Swarm intelligence.

REFERENCES:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, Pearson Education, 2004.
2. M. Mitchell, *An Introduction to Genetic Algorithms*, Prentice-Hall, 1998.
3. D. E. Goldberg, *Genetic Algorithms in Search, Optimization, and Machine Learning*, Addison-Wesley, 1989.
4. S. V. Kartalopoulos, *Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications*, IEEE Press - PHI, 2004.
5. S. Rajasekaran & G. A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications*, PHI, 2003.

CS3E10 - WIRELESS AND SENSOR NETWORKS

Unit – I

Over view of wireless sensor networks- Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

Unit – II

Architectures- Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Unit – III

Networking Sensors-Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

Unit – IV

Infrastructure Establishment-Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Unit – IV

Sensor Network Platforms and Tools - Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

REFERENCES:

1. Holger Karl & Andreas Willig, *Protocols And Architectures for Wireless Sensor Networks*, John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, *Wireless Sensor Networks- An Information Processing Approach*, Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, *Wireless Sensor Networks- Technology, Protocols, And Applications*, John Wiley, 2007.
4. Anna Hac, *Wireless Sensor Network Designs*, John Wiley, 2003.

CS3E11 - CRYPTOGRAPHY AND NETWORK SECURITY

Unit I

Computer security concepts – challenges – security attacks – security services – security mechanisms – a model for network security. Cryptography – symmetric encryption principles – cryptography – cryptanalysis – Feistal Cipher structure. Symmetric block encryption algorithms - DES – Triple DES – AES – random and pseudorandom numbers – stream cipher and RC4 – cipher block modes of operation.

Unit II

Message authentication – approaches – MAC – one way Hash function – secure Hash functions – Message Authentication Codes. Public key cryptography principles – algorithms – digital Signatures.

Unit III

Network security applications – symmetric key distributions using symmetric encryption – Kerberos version 4 - key distributions using asymmetric encryption – X.509 certificates -public key infrastructure – federated identity management.

Unit IV

Transport level security – web security considerations – secure socket layer and transport layer security – SSL architecture – SSL record protocol – change cipher spec protocol – handshake protocol. Transport layer security - HTTPS – SSH. IP Security – overview – policy – encapsulating security payload – combining security associations – internet key exchange.

Unit V

Intruders - intruders, intrusion detection, password management. Malicious software – types, viruses, countermeasures, worms, DDoS. Firewalls – need – characteristics, types, firewall basing, location and configuration – DMZ networks, VPN – distributed firewalls.

REFERENCES:

1. William Stallings, *Network Security Essentials Applications and Standards*, 4th Edition, Pearson India, ISBN: 8131761754.
2. William Stallings, *Cryptography and Network Security : Principles and Practice*, 6th Edition, Pearson India, ISBN: 9332518777.
3. Atul Kahate, *Cryptography and Network Security*, 3rd Edition, Tata McGraw-Hill Publishing, ISBN: 9789332900929.
4. Eric Maiwald, *Fundamental of Network Security*, 1st Edition, Tata McGraw - Hill Education, 0071070931.
5. Charlie Kaufman, Radia Perlman and Mike Speciner, *Network Security: Private Communication in Public World*, 2nd Edition, PHI Learning Pvt Ltd, ISBN: 8120322134.

CS3E12 - DATA WAREHOUSING AND DATA MINING

Unit I

Data warehouse – definition – operational database systems Vs data warehouses – multidimensional model – from tables and spreadsheets to Data Cubes – schemas for multidimensional databases – measures – concept hierarchies - OLAP operations in the multidimensional data model – data warehouse architecture.

Unit II

Data mining – introduction – definition - data mining functionalities – major issues in data mining - data preprocessing – data cleaning – data integration and transformation – data reduction – data discretization and concept hierarchy generation. Association rule mining - efficient and scalable frequent item set mining methods – mining various kinds of association rules – association mining to correlation analysis – constraint-based association mining.

Unit III

Classification and prediction - issues regarding classification and prediction – classification by decision tree introduction – Bayesian classification – rule based classification – classification by back propagation – support vector machines – associative classification – lazy learners – other classification methods – prediction – accuracy and error measures – evaluating the accuracy of a classifier or predictor – ensemble methods – model section.

Unit IV

Cluster analysis - types of data in cluster analysis – a categorization of major clustering methods – partitioning methods – hierarchical methods – density-based methods – grid-based methods – model-based clustering methods – clustering high dimensional data – constraint-based cluster analysis – outlier analysis.

Unit V

Graph mining - mining object, spatial, multimedia, text and web data - multidimensional analysis and descriptive mining of complex data objects – spatial data mining – multimedia data mining – text mining – mining the World Wide Web.

REFERENCES:

1. Jain Pei, Jiawei Han and Micheline Kamber, *Data Mining Concepts and Techniques*, 3rd Edition, Elsevier.
2. Alex Berson and Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Computing Mcgraw-Hill.
3. K.P. Soman, Shyam Diwakar and V. Ajay, *Insight into Data mining Theory and Practice*, 1st Edition, Prentice Hall of India.

CS3E13 – INFORMATION RETRIEVAL SYSTEMS

Unit – I

Introduction: Information versus Data Retrieval, IR: Past, present, and future. Basic concepts: The retrieval process, logical view of documents. Modeling: A Taxonomy of IR models, ad-hoc retrieval and filtering. Classic IR models: Set theoretic, algebraic, probabilistic IR models, models for browsing.

Unit – II

Retrieval evaluation: Performance evaluation of IR: Recall and Precision, other measures, Reference Collections, such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.

Unit – III

Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching: Inverted files, Suffix trees, Suffix arrays, signature files, sequential searching, Pattern matching.

Unit – IV

Multimedia IR: Spatial access methods, Generic multimedia Indexing approach, Distance functions, feature extraction, Image features and distance functions. Searching the Web: Characterizing and measuring the Web.

Unit – V

Search Engines: Centralized and Distributed architectures, user Interfaces, Ranking, Crawling the Web, Web directories, Dynamic search and Software Agents. Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example – TREC results.

REFERENCES:

1. Kowalski, Gerald, Mark T Maybury: *Information Retrieval Systems: Theory and Implementation,* Kluwer Academic Press, 1997.
2. Frakes, W.B., Ricardo Baeza-Yates: *Information Retrieval Data Structures and Algorithms,* Prentice Hall, 1992.
3. Yates, *Modern Information Retrieval,* Pearson Education.
4. Robert Korfhage, *Information Storage & Retieval,* John Wiley & Sons.

CS3E14-REMOTE SENSING AND GIS

Unit- I

Fundamentals: Definition – scope – types and chronological development – ideal and real remote sensing system. Comparison of conventional survey, aerial remote sensing and satellite remote sensing – advantage and limitation of satellite remote sensing. EMR and Remote Sensing: Energy sources – electro magnetic radiation – spectral regions – energy interaction in the atmosphere – atmosphere window – energy interaction with earth surface features –spectral reflectance patterns for different region of EMR. Actors affecting remote sensing signatures. Platforms- data capture types and systems – data recording methods.

Unit-II

GIS and spatial data- Definition – maps spatial information – computer assisted mapping and analysis – components of GIS –people and GIS – maps and spatial data – thematic characteristics of spatial data ad GPS coordinate system– other sources of spatial data; census ad survey data, air photos, satellite images, field data. Data analysis operations in GIS, Terminologies measurements of lengths, perimeter and area in GIS – queries – reclassification buffering and neighborhood functions – integrated data.

Unit- III

Raster and vector overlay method: point-in-polygon and polygon and polygon-on- polygon problems of raster and vector overlays – spatial interpolation – GIS for surface analysis – network analysis: shortest path problem, location – allocation of resources – route tracking. Models of spatial processes: natural and scale analogue models – conceptual models – mathematical model – models of physical and environmental processes. Maps as output – alternative cartographic outputs – non– cartographic outputs – spatial multimedia – delivery mechanism – GIS and spatial decision supports –maps as decision tools.

Unit- IV

Remote sensing data: types – digital, analogue – fluvial land forms - - drainage pattern – erosional and depositional landforms – flood plain mapping – coastal landforms - erosional and depositional features – glacial landforms.

Unit- V

Land use/land cover: Corp assessment, disease detection, forestry: types – species identification and diseases detection. Soils: soil mapping – soil moisture – soil erosion – reservoir station – soil salinity – soil conservation. Water resources: surface water resources – water quality monitoring and mapping – water pollution, identification of ground water potential recharge areas – integrated watershed development.

REFERENCES:

1. Lilesand, TM John, *Remote sensing and Image interpretation*, Wiley.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, *An Introduction to Geographical Information Systems*, Pearson Education, 2007

CS3C16 – PRACTICAL-3

Unit-I

Advanced Java Programming

1. Programming with JDBC API to create, insert into, update, and query tables.
2. Programming using JNDI as naming and directory service.
3. RMI client/server programming
4. CORBA client/server programming
5. Server side programming using servlet
6. Development and deployment of EJB

Unit-II

Web Technology

1. Create HTML, XHTML, DHTML, XML documents.
2. Programming and web development using CGI-Perl.
3. Creation of dynamic web content using JSP
4. Creation of dynamic database driven sites with PHP & MySQL
5. Programming and web development using Python

CS4C18 - SOFTWARE ENGINEERING

Unit- I

The Evolving role of Software –A generic view of process– Software Engineering: A Layered Technology- Process Framework - Product and Process. Process Models – The Waterfall Model – Agile model- SDLC-Incremental Process Models – The RAD Model – Evolutionary Process Models– Prototyping – The Spiral Model – The Concurrent Development Model.

Requirements Engineering: Requirements engineering tasks – Initiating the Requirements Engineering Process-Eliciting Requirements – Developing use cases – Building the Analysis Models– Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – Validating Requirements, SRS Document.

Unit- II

System models – context models – behaviour models – data models – objects models – CASE workbenches – software prototyping – prototyping in the software process– formal specification – formal specification in the software process – interface specification – behavior specification – architectural design – system structuring – control models – modular decomposition – domain specific architectures

Unit- III

Object-oriented design – objects and classes – an object oriented design process case study – design evolution - design with reuse – component based development – application families – user interface design – design principles – user interaction – information presentation – user support – interface evaluation.

Unit- IV

Software Testing Fundamentals- Test Case Design, Flow Graph Notation, Cyclomatic Complexity, Software testing strategies - Equivalence Partitioning, Boundary Value Analysis, Comparison Testing, Orthogonal Array Testing - Software maintenance – software change – software re-engineering – data re-engineering.

Unit- V

Software project management – project planning – scheduling –managing people – group working – – the people capability maturity model – software cost estimation – productivity estimation techniques — quality assurance and standards – quality planning – quality control – software measurement and metrics – process improvement – process and product quality – process analysis and modeling – process measurement – process CMM

Risk management – Software Risks, Risk Identification, Assessing Overall Project, Risk Components and Drivers, Risk Projection, Assessing Risk Impact, Risk Assessment, Risk Refinement, Risk Mitigation, Monitoring, and Management.

REFERENCES:

1. Ian Somerville, *Software Engineering*, Pearson Education Asia. Reference books
2. Pressman R.S, *Software Engineering*, McGraw Hill
3. Jalote P, *An Integrated Approach to Software Engineering*, Narosa
4. Mall R, *Fundamentals of Software Engineering*, Prentice Hall India

CS4E15 – PATTERN RECOGNITION

Unit – I

Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces – error probabilities and integrals - normal density - discriminant functions for normal density.

Unit – II

Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general Bayesian learning – nonparametric technic – density estimation - parzen windows - k-nearest neighbour estimation - estimation of posterior probabilities - nearest-neighbour rule - k-nearest neighbour rule.

Unit – III

Linear discriminant functions - linear discriminant functions and decision surfaces - generalized linear discriminant functions - 2-category linearly separable case - non-separable behaviour - linear programming algorithms, support vector machines- multilayer neural networks – feed forward operation and classification, back propagation algorithm, error surface, back propagation as feature mapping.

Unit – IV

Syntactic methods – stochastic search- Boltzmann learning – Nonmetric methods- decision trees- CART – other tree methods, grammatical methods, grammatical inference.

Unit – V

Unsupervised learning and clustering – mixture densities and identifiability, maximum likelihood estimates, applications to normal mixtures, unsupervised Bayesian learning, data description and clustering.

REFERENCES:

1. R.O.Duda, P.E.Hart and D.G.Stork, *Pattern Classification*, John Wiley, Second edition, 2006
2. Gonzalez R.C. & Thomson M.G., *Syntactic Pattern Recognition - An Introduction*, Addison Wesley.
3. Fu K.S., *Syntactic Pattern Recognition And Applications*, Prentice Hall, Eaglewood cliffs
4. Rajan Shinghal, *Pattern Recognition: Techniques and Applications*, Oxford University Press, 2008.

CS4E16 - NATURAL LANGUAGE PROCESSING

Unit – I

Introduction – Models -and Algorithms - The Turing Test -Regular Expressions Basic Regular Expression Patterns -Finite State Automata -Regular Languages and FSAs – Morphology - Inflectional Morphology - Derivational Morphology -Finite-State Morphological Parsing - Combining an FST Lexicon and Rules -Porter Stemmer.

Unit – II

N-grams Models of Syntax - Counting Words - Unsmoothed N-grams – Smoothing- Backoff - Deleted Interpolation – Entropy - English Word Classes - Tagsets for English - Part of Speech Tagging -Rule-Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

Unit – III

Context Free Grammars for English Syntax- Context-Free Rules and Trees - Sentence- Level Constructions –Agreement – Sub Categorization – Parsing – Top-down – Earley Parsing - Feature Structures - Probabilistic Context-Free Grammars.

Unit – IV

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus- Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis - Semantic Attachments - Syntax-Driven Analyzer - Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval.

Unit – V

Discourse -Reference Resolution - Text Coherence -Discourse Structure - Dialog and Conversational Agents - Dialog Acts – Interpretation – Coherence –Conversational Agents - Language Generation – Architecture -Surface Realizations – Discourse Planning – Machine Translation -Transfer Metaphor – Interlingua – Statistical Approaches.

REFERENCES:

1. D.Jurafsky and J. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition*,2nd Edition, Prentice Hall, 2008.
2. C. Manning and H. Schutze, *Foundations of Statistical Natural Language Processing*", MIT Press, 1999.
3. James Allen. *Natural Language Understanding*, Addison Wesley, 1994.

CS4E17 - BIO INFORMATICS

Unit – I

Cells-Prokaryotes and Eukaryotes-DNA double helix- central dogma – RNA, Amino acids, Proteins -string representations- different levels of protein structures-DNA cloning- A brief introduction to different mappings techniques of genomes- genome sequencing methods-DNA micro arrays –Human Genome Project-A glossary of biological terms.

Unit – II

Scope of bioinformatics-Genomics and Proteomics- Problems in bioinformatics - sequence alignment, phylogeny, gene finding, microarray analysis, Homology and evolutionary relationships; Homology analysis and function of an entire gene or of segments within it, secondary structure prediction, protein structure prediction, comparative genomics and drug design.

Unit - III

Data management, Data life cycle, An introduction to the major resources at NCBI, EBI and ExPASy- Nucleic acid sequence databases: GenBank, EMBL, DDBJ –Protein sequence databases: SWISS-PROT, TrEMBL, PIR_PSD - Genome Databases at NCBI, EBI, TIGR, SANGER – How to access these databases and to make use of the tools available. Various file formats for bio-molecular sequences like genbank and fasta, the concept of profiles- The derived databases- Prosite, Pfam, PRINTS, CATH, SCOP.

Unit – IV

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Scoring matrices: basic concept of a scoring matrix, PAM and BLOSUM matrices, differences between distance & similarity matrix, Pairwise sequence alignments: basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments, BLAST and FASTA and their versions, Multiple sequence alignments (MSA): the need for MSA, basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.), Algorithm of CLUSTALW.

Unit – V

Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees, Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining, Gene Finding: The six reading frames-Computational gene finding in prokaryotes and eukaryotes Basic signals –start and stop codons, promoters etc- important coding measures- Regular expressions- Introduction to Hidden Markov models- Introduction to genomic signal processing Molecular visualization: Visualization of protein structures using Rasmol or Rastop

REFERENCES:

1. Hooman H. Rashidi and Lukas K.Buehler, *Bioinformatics Basics. Applications in Biological Science and Medicine*, CAC Press 2000.
2. Dan Gusfiled, *Algorithms on Strings Trees and Sequences*, Cambridge University Press 1997.
3. P. Baldi. S. Brunak, *Bioinformatics: A Machine Learning Approach*, MIT Press, 1988.
4. Harshawardhan P.Bal, *Bioinformatics – Principles and Applications* –Tata MeGraw Hill

CS4E18 – MOBILE COMMUNICATION

Unit – I

Introduction, wireless transmission - frequencies for radio transmission - signal propagation - multiplexing - modulation - spread spectrum - cellular systems - medium access control - specialized MAC - SDMA - FDMA - TDMA – classical and slotted aloha - CSMA - collision avoidance - polling - CDMA - comparison of S/T/F/CDMA.

Unit – II

Telecommunication systems – GSM-mobile services - system architecture - radio interface - protocols - localization and calling - handover - security - new data services - satellite systems-routing- localization – handover- broadcast systems - digital audio and video broadcasting.

Unit – III

Wireless LAN-Infra red Vs radio transmission -infra structure and adhoc networks-IEEE 802.11, hyperlan- Bluetooth -IEEE 802.15

Unit – IV

Mobile network layer - mobile IP – IP packet delivery - registration - tunneling and encapsulation - optimizations - reverse tunneling - dynamic host configuration protocol-Mobile ad-hoc networks, Transport Layer-TCP-Indirect TCP-Snooping TCP-Mobile TCP- retransmission-recovery-transaction oriented TACP

Unit – V

WAP-Design and principles of operations, WAP architecture, Overview-WAP model, components-WAE, overview-WWW model-WAE model-WTA architecture, Wireless session protocol specifications-Wireless transaction protocol specification-security specification-Wireless datagram protocol-wireless control message protocol specification.

REFERENCES:

1. Schiller J., *Mobile Communications*, Addison Wesley, 2/e, Pearson Education, 2009.
2. Gray.S.Rogers,John Edwards, *An Introduction to Wireless Technology*, Pearson Education
3. Singhal et.al S., *The Wireless Application Protocol*, Addison Wesley
4. C. Siva Ram Murthy, *WDM Optical Networks: Concepts, Design, and Algorithms*, Pearson Education.
5. Yi-Bang Lin and Imrich Chlamtac, *Wireless and Mobile Architectures*, Wiley Student Edition, 2008.
6. William Stallings, *Wireless Communications and Networks*, Prentice Hall, 2004
7. Vijay K.Garg, *Wireless Communications and Networking*, Morgan Kaufmann Publishers / Elsevier, 2009.

CS4E19 - SEMANTIC WEB TECHNOLOGY

Unit I

Components – types – ontological commitments – ontological categories – philosophical background – knowledge representation ontologies – toplevel ontologies – linguistic ontologies – domain ontologies – semantic web – need – foundation – layers – architecture.

Unit II

Languages for semantic web and ontologies - web documents in XML – RDF - schema – web resource description using RDF - RDF properties – topic maps and RDF – overview – syntax structure – semantics – pragmatics - traditional ontology languages – LOOM - OKBC – OCML - Flogic Ontology Markup Languages – SHOE – OIL – AML – OIL – OWL.

Unit III

Ontology learning for semantic web - taxonomy for ontology learning – layered approach – phases of ontology learning – importing and processing ontologies and documents – ontology learning algorithms – evaluation.

Unit IV

Ontology management and tools - overview – need for management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. Evolution – development of tools and tool suites – ontology merge tools – ontology based annotation tools.

Unit V

Applications - web services – semantic web services - case study for specific domain – security issues – current trends.

REFERENCES:

1. Asuncion Gomez-Perez, Oscar Corcho and Mariano Fernandez-Lopez, *Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web*, 1st Edition, Springer.
2. Grigoris Antoniou and Frank van Harmelen, *A Semantic Web Primer*, The MIT Press
3. Liyand, *Introduction to the Semantic Web and Semantic Web Services*, Chapman.
4. Alexander Maedche, *Ontology Learning for the Semantic Web*, Springer, 2002nd Edition,
5. John Davies, Dieter Fensel and Frank Van Harmelen, *Towards the Semantic Web: Ontology – Driven Knowledge Management*, 1st Edition, Wiley.
6. Dieter Fensel, Wolfgang Wahlster, Henry Lieberman and James Hendler, *Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential*, The MITPress.

CS4E20 – VIRTUALIZATION AND CLOUD COMPUTING

Unit I

Introduction - evolution of cloud computing – system models for distributed and cloud computing – NIST cloud computing reference architecture – Infrastructure as a Service (IaaS) – resource virtualization – Platform as a Service (PaaS) – cloud platform & management – Software as a Service (SaaS) – available service providers.

Unit II

Virtualization - basics of virtualization - types of virtualization - implementation levels of virtualization - virtualization structures - tools and mechanisms - virtualization of CPU, memory, I/O devices - desktop virtualization – server virtualization – Linux KVM, Xen, Qemu, LXC, OpenVZ.

Unit III

Cloud infrastructure - FOSS cloud software environments - Eucalyptus, Open Nebula, OpenStack – OpenStack architecture – compute, object storage, image service, identity, dashboard, networking, block storage, metering, basic cloud orchestration and service definition.

Unit IV

Programming model - parallel and distributed programming paradigms – Mapreduce, twister and iterative Mapreduce – mapping applications - programming support – Apache Hadoop – HDFS, Hadoop I/O, Hadoop configuration, MapReduce on Hadoop.

Unit V

Security in the cloud - security overview – cloud security challenges – software-as-a-service security – security governance – risk management – security monitoring – security architecture design – data security – application security – virtual machine security – Qubes – desktop security through Virtualization.

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, *Distributed and Cloud Computing (From Parallel Processing to the Internet of Things)*, Elsevier Science..
2. John W. Rittinghouse and James F. Ransome, *Cloud Computing: Implementation, Management, and Security*, 1st Edition, CRC Press.
3. Toby Velte, Robert Elsenpeter and Anthony Velte, *Cloud Computing, A Practical Approach*, TMH.
4. George Reese, *Cloud Application Architectures*, 1st Edition, Shroff /O'Reilly.
5. Ravi Nair and Jim Smith, *Virtual Machines: Versatile Platforms for Systems and Processes*, 1st Edition, Elsevier Science / Morgan Kaufmann,
6. Katarina Stanoevska - Slabeva, Thomas Wozniak, Santi Ristol, *Grid and Cloud Computing – A Business Perspective on Technology and Applications*, Springer.
7. Open stack Operations Guide, http://docs.openstack.org/ops/.
8. Tom White, *Hadoop: The Definitive Guide*, O'Reilly Media.

CS4E21 - STORAGE AREA NETWORK

Unit I

Basic networking concepts and topologies - OSI reference model, common network devices, network topologies, MAC standards - need for storage networks – storage devices - techniques evolution - benefits of SANs - SAN components and building blocks - fibre channel basics - fibre channel topologies, fibre channel layers, classes of service SAN topologies.

Unit II

SAN fundamentals - SAN operating systems software and hardware types of SAN technology - technology and configuration, high scalability and flexibility standards - storage management challenges - networked storage implementation challenges - storage subsystems for video services.

Unit III

Storage networking architecture storage in storage networking - challenges, cost and performance network in storage networking - fibre channel, emerging SAN interconnect technologies - basic software, advanced software, backup software implementation strategies.

Unit IV

Storage network management in-band management out-of-band management -SNMPHTTP - TELNET storage network management issues - storage resource management - storage management, storage, systems and enterprise management integration.

Unit V

Designing and building a SAN - design considerations - business requirements - physical layout, placement, storage, pooling, data availability, connectivity, scalability, migration, manageability, fault tolerance and resilience - prevention of congestion – routability - backup and restoration - SAN security & iSCSI technology - basic security guidelines - implementing SAN security - backup and restoration in iSCSI technology - future of SANS.

REFERENCES:

1. Meeta Gupta, *Storage Area Network Fundamentals*, Cisco Press.
2. John R. Vacca, *The Essential Guide to Storage Area Networks*, 1st Edition, Prentice Hall,
3. Richard Barker and Paul Massiglia, *Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs*, Wiley India Pvt Ltd.
4. Tom Clark, *Designing Storage Area Networks: A Practical Reference for Implementing Fibre Channel and IP SANs*, 2nd Edition, Addison Wesley Professional.
5. Robert Spalding, *Storage Networks: The Complete Reference*, 1st Edition, Tata McGraw-Hill Education.
6. Christopher Poelke and Alex Nikitin, *Storage Area Networks for Dummies*, 2nd Edition,
7. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka and Nils Haustein, *Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, iSCSI, InfiniBand and FCoE*, Wiley India Pvt Ltd.

CS4E22 – SOFTWARE DEVELOPMENT FOR PORTABLE DEVICES

Unit I

Introduction to Mobile Web (HTML 5) - Semantic Elements – Structural Elements - Basic formatting tags - heading, paragraph, underline break, bold, italic, underline, superscript, subscript, font and image. Different attributes like align, color, bgcolor, font face, border, size. Navigation Links using anchor tag - internal, external, mail and image links. Lists - ordered, unordered and definition, table tag, HTML5 form controls - form, input types – color, date, datetime, datetime-local, email, month, number, range, search, tel, time, url, week, text, password, textarea, button, checkbox, radio button, select box, hidden controls, calendar, date, time, email, url, search. Datalist, keygen, output - Introduction to CSS3.

Unit II

jQuery – introduction - Adding jQuery to web pages – downloading – accessing from CDNs - jQuery syntax - jQuery selectors - event methods - ready(), click(), dblclick(), mouseenter(), mouseleave(), mousedown(), mouseup(), hover(), foucs(), blur() - effects – hide, show, fading, sliding, animation - callback functions – chaining - methods for changing and manipulating HTML elements and attributes - adding new elements/content - append(), prepend(), after(), before() – removing elements - remove(), empty() - manipulating CSS3 - dimensions of elements and browser window – traversing – ancestors, descendants, siblings.

Unit III

Introduction to Android and smart phones, Android architecture & virtual machine, mobile technology terminologies, setting up the environment, setting up emulators, Android fundamentals - activities and applications activity life cycles, activity stacks, activity states. Introduction to manifest, resources & R.java, assets, values – strings.xml - form widgets, views, layouts & drawable resources - XML layouts, linear layouts, relative layouts, table layouts, Android widgets, UI XML specifications events, bundles & intents - explicit intents implicit intents event broadcasting with intents event reception with broadcast receivers, adapters and data binding.

Unit IV

Files, content providers and databases - saving and loading files, SQLite databases - Android database design - exposing access to a data source through a content provider content provider registration native content providers, Android Debug Bridge (adb) tool, Linkify.

Unit V

Adapters and widgets, notifications, custom components threads running on UI thread, Worker thread handlers & runnable asyntask (in detail), playing audio and video, recording audio and video, using the camera to take and process pictures. Networking & location based services - live folders, using sdcards – reading and writing, XML parsing - JSON parsing - including external libraries in applications, Map-based activities, Maps via intent and Map activity GPS, location based services configuration, geocoding, accessing phone services (Call, SMS, MMS), network connectivity services, using Wifi & Bluetooth action bar tabs and custom views on action bars.

REFERENCES:

1. Terry Felke-Morris, Web *Development & Design Foundations with HTML5*, Addison-Wesley.
2. *Html 5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and Jquery*, Kogent Learning Solutions Inc.
3. Kessler, *Programming HTML 5 Applications*, OReilly Media.
4. Robin Nixon, *Html5 For Ios And Android: Beginner Guide*, McGraw-Hill Edu.India Pvt .Ltd,.
5. Lauren Darcey and Shane Conder, *Android Wireless Application Development : Android Essentials (Volume 1)*, 3rd Edition, Pearson Education.
6. Zigurd Mednieks, Rick Rogers, Lombardo John and Blake Meike, *Android Application Development*, 1st Edition, O'Reilly Meida,
7. Reto Meier, *Professional Android 2 Application Development*, 1st Edition, Wiley India Pvt Ltd,

CS4E23- FUNDAMENTALS OF BIG DATA

Unit I

Introduction to Big Data – definition & importance of Big Data - four dimensions of Big Data - volume, velocity, variety, veracity – importance of big data – structured data, unstructured data - the role of a CMS in big data management - integrating data types into a big data environment - distributed computing and Big Data. Big Data stack – layer 0,1 and 2 – Big Data management – operational databases – relational databases – non relational databases – NoSQL - key-value pair databases – document databases - columnar databases - graph databases - spatial databases.

Unit II

Big Data analysis - basic analytics - operationalized analytics - modifying business intelligence products to handle Big Data - Big Data analytics examples - Analytics solutions - text analytics - exploring unstructured data - understanding text analytics - analysis and extraction techniques - the extracted information - text analytics tools for Big Data - custom applications for Big Data analysis – R Environment - Google Prediction API - Characteristics of a Big Data Analysis Framework.

Unit III

NoSQL databases - types - Advantages over Relational Databases - MongoDB – introduction - MongoDB philosophy - the data model – designing the database – collections – documents - data types - the _id Field – indexes - viewing available databases and collections – opening a database - inserting data - querying for data – retrieving documents - aggregation commands - grouping results - conditional operators - specifying an array of matches – applying criteria for search - $slice - $size - $exists - $type - $elemMatch - $not (meta-operator) - update() - save() - $inc - $set - $unset - $push - $pushAll - $addToSet - removing elements from an array - atomic operations - modifying and returning a document atomically - renaming a collection - removing data - referencing a database - implementing index-related functions - min() and max().

Unit IV

Hadoop – history – components – HDFS - MapReduce Basics – origins of MapReduce - map function – reduce function – putting them together – Hadoop common components – application development in Hadoop – Pig and Pig Latin – Load – Transform – Dump and Store – Hive – Jaql – getting our data into Hadoop – basic copy data – Flume – Zookeeper – HBase – Oozie – Lucene – Avro.

Unit V

Understanding MapReduce - key/value pairs - the Hadoop Java API for MapReduce - the Mapper class - the Reducer class - the Driver class - writing simple MapReduce programs - Hadoop-provided mapper and reducer implementations - Hadoop-specific data types - the Writable and WritableComparable interfaces - wrapper classes - Input/output - InputFormat and RecordReader - OutputFormat and RecordWriter. Implementing WordCount using streaming - analyzing a large dataset - summarizing the UFO data - summarizing the shape data - a relational view on data with Hive - creating a table for the UFO data - inserting the UFO data - redefining the table with the correct column separator - creating a table from an existing file - SQL views.

REFERENCES:

1. Hurwitz, Alan Nugent, Fern Halper and Marcia Kaufman, *Big Data for Dummies*.
2. Eelco Plugge, Peter Membrey and Tim Hawkins, *The Definitive Guide to MongoDB: The NOSQL Database for Cloud and Desktop Computing*, 1st Edition, Apress,
3. Chris Elaton, Derk Deroos, Tom Deutsch, George Lapis and Pual Zikopoulos, *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, 1st Edition, Garry Turkington, *Hadoop Beginner's Guide*, Packt Publishing Ltd,

General Pattern of Question Paper

Core and Elective courses in M.Sc. Computer Science Programme

Under CCSS (with effect from 2014 Admission)

Code: **Reg. No:**

Name :

1st/2nd/3rd/4th Semester M.Sc. Computer Science Degree Examination – 2014

CCSS – M.Sc. Programme

Course Code : (eg: CS1C02) **Course : (Eg: Advanced Data Structures and Algorithms)**

Time: 3 Hours **Total Marks: 80**

Answer five full questions; Each Question carries 16 marks.

Question Numbers 1 to 8 Total Marks = 5 x 16 Marks = 80 Marks

NOTE: Minimum one question from each of the five modules. Remaining three questions can be from any module. There should not be more than two questions from the same module.