UNIVERSITY OF CALICUT

(Abstract)

Scheme and Syllabus of M. Sc Computer Science-Choice based Credit Semester System-in University Teaching Departments-implemented with effect from 2011 admission-orders issued.

GENERAL & ACADEMIC BRANCH-IV 'J' SECTION

No. GA IV/J1/4639/10 Dated, Calicut University PO, 24.01.2012

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

2. Item No.1 of the Minutes of the meeting of Board of studies in Computer Science and application (Single Board) held on 15.11.2011

3. Orders of the Vice-Chancellor in the file of even no. dated 19.01.2012

O R D E R

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.

Vide paper read as (2) above, the syllabus of M.Sc. Computer Science Programme under Choice based Credit Semester System (PG) was approved by the Board of Studies in Computer Science and Application.

The Vice-Chancellor, in view of exigency, exercising the powers of Academic Council has approved the minutes of the meeting of the Board, subject to ratification by the Academic Council.

Sanction has, therefore, been accorded to implement the scheme and syllabus of M.Sc. Computer Science programme under Choice based Credit Semester System (PG) in University Teaching Departments/Schools w.e.f 2011 admission.

Orders are issued accordingly. Scheme and Syllabus appended.

Sd/-

ASSISTANT REGISTRAR(G&A -IV)
For REGISTRAR

To

1. The HOD of Computer Science.
2. The Chairman
   Board of Studies in Computer Science

Forwarded/By Order

Copy to:

PS to Vice-Chancellor/
PA to PVC /PA to Registrar/
CE/Digital wing (with a request to upload in the University website)
/Enquiry/Information Centres/
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GAIII/DDLFA/SF/FC

SECTION OFFICER

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UNIVERISTY OF CALICUT

Department of Computer Science

Regulations, Scheme of Evaluation Course, Structure Syllabus for

M.Sc. Computer Science

Under CCSS (with effect from 2011 Admission)

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.

1. **Duration** of the course shall be 2 years, divided into 4 semesters. The entire period of the fourth semester shall be divided for the two elective (Elective 3 and Elective 4) 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. **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 out side 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)

M.Sc. Computer Science

Under CCSS (with effect from 2011 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	Object Oriented Programming with Java	3	1	3	----	80	20	100	4
4	CS1C04	Theory of Computation	3	1	3	----	80	20	100	4
5	CS1C05	Advanced Microprocessors & Microcontroller	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	Advanced Java Programming	3	1	3	----	80	20	100	3
5	CS2E01/ CS2E02/ CS2E03	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 - Compiler Design	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	Software Engineering	3	1	3	---	80	20	100	4
2	CS3C13	Computer Graphics	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	CS3E04/ CS3E05/ CS3E06	Elective 2	3	1	3	----	80	20	100	4
6	CS3C16	Practical 3	10	5	---	3	80	20	100	3
	Total		25	10	-	-	-	-	600	22

Elective 2	Credit
CS3E04 - Digital Image Processing	4
CS3E05 - Simulation and Modeling	4
CS3E06 - Wireless and sensor Networks	4

Semester 4

Sl. No	Course Code	Course	Instructional Hrs/week		Exam Duration		Marks			Credit
			Lect. / Lab	Tutorial	Theory	Practical	ESA	CA	Total	
1	CS3C12	Elective 3	3	1	3	---	80	20	100	4
2	CS3C13	Elective 4	3	1	3	----	80	20	100	4
			Duration of the Project				Viva voce	CA	Total	
3	CS3C17	Project Work & Viva	16 Weeks				300	100	400	8
	Total		6	2	-	-	-	-	600	16

Elective 3 and Elective 4	Credit
CS4E07 - Pattern Recognition	4
CS4E08 - Soft Computing Techniques	4
CS4E09 - Natural Language Processing	4
CS4E10 – Information Retrieval Systems	4
CS4E11 - Distributed Computing	4
CS4E12 - Bio Informatics	4
CS4E13 - Mobile Communication	4
CS4E14 - Grid Computing	4
CS4E15 - Remote Sensing and GIS	4
CS4E16 - Embedded Systems	4

General Pattern of Question Paper

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

Under CCSS (with effect from 2011 Admission)

Code: **Reg. No:**

Name :

1st/2nd/3rd/4th Semester M.Sc. Computer Science Degree Examination – 2011

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.

M.Sc. Computer Science

Under CCSS (with effect from 2011 Admission)

SYLLABUS

CS1C01 - DISCRETE MATHEMATICAL STRUCTURES

Unit - 1

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 – One-to-one, onto functions – Composition of Functions and Inverse Functions – Hashing Functions - Hasse digrams.

Unit - IV

Group Theory - Definition and Elementary Properties- Cyclic Groups- Homomorphism and Isomorphism - Subgroups- Cosets and Lagrange's Theorem, Elements of Coding Theory.

Unit - V

Rings and Fields - Definitions and examples of Rings, Integral Domains and Fields- Elementary Properties and Substructures - Homomorphism and Isomorphism.

REFECENCES:

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. J.L.Mott, A. Kandel, and T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, 2/e, Prentice Hall of India, 1986
7. D.S.Malik & M.K Sen, *Discrete Mathematical Structures: Theory and Applications*, Cengage Learning, 2008
8. Aian Doerr & Kenneth Levassur, *Applied Discrete Structure for Computer Science*, Galgotia Publication.

CS1C02 - ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit - I

Overview of Data Structures, Data Abstraction & Abstract data types. Different approaches for designing algorithms. Analysis of algorithms-Complexity of Algorithms: Time & Space. Estimation of Cost & Efficiency.

Unit - II

Arrays – Records - Representation. Data Structure operations: Traversing, Inserting and deleting, sorting and searching. Linear Search & Binary Search - Complexity, Linear Data structures: Stack-operations and its implementations - Parsing arithmetic expressions, translating and evaluating; Recursion-characteristics of recursion - Applications of recursion in algorithms - 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: Graphs - representation of graphs - operations - traversals and their implementation- minimum spanning trees - shortest path problem - Efficiency of various graph algorithms. Trees - Tree traversals algorithms - Binary Tress - Threaded Binary Trees - Binary search Trees - Traversals and operations on BST - balanced trees - M-way Trees - Huffman algorithm for extended binary tree - 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. Heap: Overview of heaps-Implementation and operations.

Unit - V

Sorting techniques: Insertion sort - Selection sort - Shell sort - Bubble sort - Quick sort - Heap sort - Merge sort - External sort - Comparison of sorting 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. Sartaj Sahni, *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 to Algorithms*,Third Edition, PHI,2010.
6. Seymour Lipschutz and GAV Pai, *Data Structures*, Indian Adapted Edition, Schaum's Outlines Series, TMH, 2006

CS1C03- 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, fundamental programming structures in Java: comments - data types – variables – operators – strings - Input and Output - control flow - Arrays.

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. Multi threaded 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: The Design of JDBC - The Structured Query Language - JDBC Installation - Basic JDBC Programming Concepts - Query Execution

REFERENCE:

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.

CS1C04 - THEORY OF COMPUTATION

Unit - I

Preliminaries: Review of proof techniques - Mathematical induction - Basic concepts of languages – automata and grammar. 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.

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.Hoporoft J.E.and Ullman J.D., *Introduction to Automata Theory Languages and Computation,* Narosa, 1998.

2.Linz: P. *An Introduction to Formal Languages and Automata,* 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

CS1C05 - 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.

CS1C06 – PRACTICAL -1

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-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.
5. PUSH, POP operations of stack 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.
17. Graph traversals
18. Shortest path algorithm
19. Sorting techniques.
20. Search algorithms.

CS2C07- DESIGN AND ANALYSIS OF ALGORITHMS

Unit - I

Analysis: RAM model – Cost estimation based on key operations – big Oh, big omega, little Oh, little omega and theta notations. Recurrence analysis – Master's theorem – solution to recurrence relations with full history. Probabilistic analysis – Linearity of expectations – worst and average case analysis of quick-sort, merge- sort, heap-sort, binary search, hashing algorithms – lower bound proofs for the above problems. Amortized analysis – Aggregate, accounting and potential methods – Analysis of Knuth-Morris-Pratt algorithm –amortized weight balanced trees.

Unit - II

Design: Divide and Conquer – Strasser's algorithm, O(n) median finding algorithm. Dynamic Programming – matrix chain multiplication, optimal polygon triangulation, optimal binary search trees, Floyed-Warshall algorithm, CYK algorithm. Greedy – Huffman coding, Knapsack, Kruskal's and Prim's algorithms for MST. Backtracking – Branch and Bound, travelling salesman problem.

Unit - III

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.

Unit - IV

Introduction to parallel algorithms: PRAM models – EREW, ERCW and CRCW – relation between various models – handling read and write conflicts – work efficiency – Brent's theorem.

Unit - V

Parallel merging, sorting, and connected components, list rank, Euler tour technique, parallel prefix computation, deterministic symmetry breaking.

REFERENCES:

1. Thomas H Cormen, Charles E Leiserson, & Ronald L Rivest, *Introduction to Algorithms*, 2nd Ed. Prentice Hall of India Private Limited, New Delhi, 2001.
2. S. Basse, *Computer Algorithms: Introduction to Design and Analysis*, Addison Wesley, 1998.
3. U.Manber, *Introduction to Algorithms : A creative approach*, Addison Wesley, 1989
4. V.Aho, J.E. Hoperaft, J.D.Ullman, *The design and Analysis or Computer Algorithms*, Addison Wesley, 1974
5. Gilles Brassard & Paul Bratley, *Fundamentals of Algorithmics*, Prentice-Hall of India, 2007.
6. Goodman S E & Hedetnieni, *Introduction to the Design & analysis of Algorithms*, Mc- Graw Hill, 2002.
7. Horowitz E & Sahni S, *Fundamentals of Computer Algorithms*, Galgotia Publications Pvt. Ltd, 2004
8. Sahni, *Data Structures, Algorithms and Applications in C++*, Tata Mc-Graw Hill, 1998.

CS2C08- ADVANCED DATABASE MANAGEMENT SYSTEM

Unit - I

Database System Concepts, ER Datamodel, Relational data model and Relational database.
Relational Database Query Languages- Basics of QBE and SQL. Integrity and security - domain constraints, referential integrity, assertions, triggers, authorization, views.

Unit - II

Relational database design – Design Principles, Normalization, Normal Forms. Transactions - concepts, states of Transactions, ACID properties. Schedules - serial schedules, concurrent schedules, Serializability, Concurrency control protocols.

Unit - III

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

Unit - IV

Case Study of MySQL – Creating/Altering/Dropping Database and tables, Data types, Operators and Functions, Data Definition and Manipulation Statements.

Unit - V

Flow control constructs, CodeBlocks, Stored Procedures and Functions, Cursors, Triggers, Transactional and Locking statements, Account Management Statements.

REFECENCES:

1.Abraham Silbersehatz, 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.Ramakrishnan and Gehrke, *Database Management Systems*, 3rd Edn, Mc Graw-Hill, 2003
4.Vikram Vaswani, *MySQL The complete Reference*,1st Edition, Tata McGraw-Hill, 2004.
5.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, Compiler, Linker, Loader. Fundamentals of OS**:** OS services and components, 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.

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.

Unit - IV

File Systems: File concept, File support, Access methods, Allocation methods, Directory systems, File Protection, Free Space management.

Unit - V

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 Linux system and Microsoft Windows XP.

REFERENCES:

1. Silberschatz & Galvin, *Operating System Concepts*, Wiley, 7th Ed.,2000.
2. Gary J Nutt, *Operating systems-A Modern Perspective*, Addison Wesley,2000
3. D. M. Dhamdhare*, Operating Systems*, Tata Mc Graw Hill, 2nd Ed.
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.

CS2C10 - 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 acontext-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.

CS2C11 – PRACTICAL -2

Unit-1

Advanced DBMS

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

Unit-2

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

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, Best–first search, Problem Reduction, Constraint Satisfaction, Means-ends analysis, Heuristic in games, Complexity issues.

Unit – III

Knowledge representation issues, representation and mappings, Representing simple facts in logic, Representing instances and ISA relationships, Computable functions and Predicates, Resolution, Natural deduction, Knowledge representation using rules, logic programming, forward versus backward reasoning, Symbolic reasoning under uncertainty- Nonmonotonic reasoning, Depth first search, Breadth first search.

Unit – IV

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 – 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, The 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.

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 – COMPILER DESIGN

Unit – I

Assemblers: Elements of Assembly Language Programming, Overview of Assembly Process, Design of two pass assembler, Macros and Macro processors, Macro definition, call and expansion , Nested Macro calls, Advanced macro facilities, Design of Macro preprocessor.

Unit – II

Linkers, linking and relocation concepts, Design of linkers, Self relocating programs, Linking for over-lays, Loaders, Introduction to compilers, Different phases. Lexical Analysis, input buffering, specification of tokens, Recognition of tokens, lexical Analyser generators, lex, Finite automata.

Unit – III

Syntax Analysis. Context free grammar, writing a grammar, Top down parsing, Bottom Up Parsing, Operator precedence , LR parsers, LR parsing algorithms, LR grammars, Construction of SLR, Canonical and LALR parsing tables. Parser generators, Yacc.

Unit – IV

Run time Environment. Storage organization schemes, Activation records, Compile time layout. Storage allocation strategies, static allocation, stack allocation, heap allocation. Accessing non-local names. Parameter passing mechanisms.

Unit – V

Symbol tables, representing scope information. Intermediate code generation, intermediate languages, declaration and assignment statements. Code generation: Issues, target machine, run time storage management, instruction selection, register allocation. Runtime storage allocation, basic blocks and flow graphs. Code optimization: Principal sources of optimization.

REFERENCES:

1. D.M. Dhamdhree, *Systems Programming and Operating Systems*, TMH, 2003.
2. A.V. Aho, R. Sethi, J.D. Ullman, *Compilers – Principles, Techniques and Tools*", Pearson Education,2003
3. A.V. Aho and J.D. Ullman, *Principles of Compiler Design*, Narosa , 2002

CS3C12 – SOFTWARE ENGINEERING

Unit-I

The Product-software process models- Project management concepts- Software Project and Project Metrics-software measurement-metrics for software quality-Integrating metrics within the software engineering process.

Unit-II

Software Project Planning –software scope resources ,software project estimation-decomposition techniques-empirical estimation models-the make/buy decision- Risk Analysis and Management, risk identification, risk projection, risk refinement- Project scheduling and Tracking, relationship between people and effort, defining a task set for the software project, scheduling - Software Quality Assurance, software reviews and technical reviews , statistical SQA, software reliability ,quality standards.

Unit-III

Software Configuration Management- System Engineering, requirement engineering, system modeling – Analysis Concepts and Principles, software prototyping and specification- Analysis modeling, data modeling, functional modeling and information flow, behavioral modeling, Mechanics for structure analysis, data dictionary.

Unit-IV

Design concepts and Principles, Design processes, principles and concepts, effective modular design, Design heuristics for effective modularity, design model and documentation - Architectural Design -User Interface Design.

Unit-V

Component Level Design- Software Testing Techniques- Software Testing Strategies, test case design, white box testing ,basis path testing, control structure and black box testing- Technical Metrics for Software.

REFERENCES:

1. R.S.Pressman, *Software Engineering A Practitioner's Approach* – MGH – 2001.
2. Ian Sommerville, *Software Engineering*, 5th Edn. Addison Wesley, 2002
3. *Theory and problems of Software Engineering*, Schaum's outline series

CS3C13 – 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

CS3C14 – DATA COMMUNICATION AND NETWORKING

Unit-I

Data & signals - analog and digital signals, line configuration ,topology ,transmission mode, media, OSI model, TCP/IP layers, multiplexing, switching, networking devices-repeaters, bridges, routers & gateways, Backbone networks, Virtual Lans.

Unit-II

Encoding - Digital data transmission & interface standards, DTE & DCE. Telephone & cable network for Transmission - Telephone network, Dial-up modems, DSL, Cable TV, Modems. Cellular Telephony, Satellite Networks.

Unit-III

Data Link Layers-Error Detection & Correction. Data Link Control-line Discipline, flow control, error control. Data link Protocol-synchronous & asynchronous protocol, Character Oriented & Bit Oriented protocol.

Unit-IV

LANs: Project 802, Ethernet, 802.11, Bluetooth-architecture, layers, radio layer, baseband layers, L2CAP & upper layers. FDDI, MANs-IEEE 802.6,SMDS.Network layer address & protocol-ARP,IP,ICMP,IPv4,IPv6 &ICMPv6, ISDN layers,BISDN,X.25 layers, packet layers protocol, Frame relay layers .ATM-design topology, protocol, architecture.

Unit-V

SONET/SDH-configuration, layers, frame. Transport layers- P to P Delivery, UDP, TCP and SCTP. Session layer, Presentation layer, Application layer-DNS.TCP/IP protocols. Remote Logging, E-mail & FTP, WWW & HTTP. Network Management, Network security, Cryptography.

REFERENCES:

1. Behrouz A. Forouzan, *Data Communications and Networking*, Fourth Edition, McGraw Hill 2001
2. Andrew S. Tanenbaum, *Computer Networks*, Fourth Edition, Prentice-Hall, 2003
3. William Stallings, *Data and Computer Communication*, Eighth Edition, Prentice-Hall, 2007

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.

Unit -II

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 – 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.

Unit- IV

PHP: Defining PHP variables – variable types – operators – control flow constructs in PHP – Establishing connection with MySQL database – managing system data – parsing data between pages

Unit -V

Python: Data types, control structures, advanced data structures, I/O, classes, modules, 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. Xue Bal 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*, 3rd edition, Pearson Education.
5. Steven Holzner, *PHP The complete Reference*,1st Edition,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, Shishir Gundavaram and Gunther Birznieks, *CGI Programming with Perl*, 2nd Edition,O'Reilly Media, 2000.

CS3C16 – PRACTICAL-3

Unit-I

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

Unit-II

Open GL Programming

1. Creating Window
2. Draw Primitives (Points , Lines, Triangle, Quads, Polygons)
3. Use colour in drawing primitives
4. Filling Polygon with colours
5. Transformations
    a. Translation
    b. Scaling
    c. Rotation
6. Beziers Curve

CS3E04 – 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.

CS3E05 – 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.

CS3E06 - 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.

CS4E07 – 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 – feedforward operation and classification, backpropagation algorithm, error surface, backpropagation 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.

CS4E08 – 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.

CS4E09 - 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.

CS4E10 – 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.

CS4E11 – 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.

CS4E12 - BIO INFORMATICS

Unit – I

Cells-Prokaryotes and Eukaryotes-DNA double helix- central dogma – RNA, aminoacids, 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

CS4E13 – 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.

CS4E14 - GRID COMPUTING

UNIT-I

Introduction- Grid Computing values and risks – History of Grid computing – Grid computing model and protocols –overview of types of Grids

UNIT-II

Types of Grids- Desktop Grids- Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture –HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

UNIT-III

Architecture and Management- The open Grid services Architecture – Analogy – Evolution – Overview – Building on the OGSA platform – implementing OGSA based Grids – Creating and Managing services – Services and the Grid – Service Discovery – Tools and Toolkits – Universal Description Discovery and Integration (UDDI)

UNIT-IV

Native Programming and Software applications- esktop supercomputing – parallel computing – parallel programming paradigms – problems of current parallel programming paradigms – Desktop supercomputing programming paradigms – parallelizing existing applications – Grid enabling software applications – Needs of the Grid users – methods of Grid deployment – Requirements for Grid enabling software – Grid enabling software applications.

UNIT-V

Applications, services and environments - Application integration – application classification – Grid requirements – Integrating applications with Middleware platforms – Grid enabling Network services – managing Grid environments – Managing Grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Different application areas of Grid computing.

REFERENCES:

1.Ahmar Abbas, *Grid Computing , A Practical Guide to Technology and Applications*, Firewall media , 2004.

2.Joshy Joseph , Craig Fellenstein , *Grid Computing*, Pearson Education , 2004.

3.Fran Berman, Geoffrey Fox, Tony Hey, *Grid Computing-Making -The Global Infrastructure A Reality*, John Wiley & Sons Ltd, 2003.

4.Rajkumar Buyya, *High Performance Cluster Computing: Architectures and Systems*, Vol. 1, PHI,1999

CS4E15-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

CS4E16-EMBEDDED SYSTEMS

Unit- I

Introduction to Embedded systems: Application areas categories of embedded systems; Standalone, Real time systems, Networked Information Appliances, Mobile devices. Overview of embedded system architecture, specialties of embedded systems; Reliability, Performances, Power consumption, Cost, Size, Limited User interface, Software up gradation capability. Recent tents in embedded Systems; Processor power Memory, Operating systems, Communication interfaces and networking capability, Programming languages, Developing tools, Programmable hardware

Unit- II

Architecture of Embedded System: Hardware architecture; CPU , Memory, Clock circuitry, Watchdog Timer/ Reset circuitry, Chip select, I/O devices , Debug port, Communication interfaces, Power supply units. Software architecture, services provided by an operating system, architecture of embedded operating system, categories of embedded operating systems. Application software, communication software. Development/ testing tools; Process of embedded system developments: Development process ,Requirements engineering ,Design, Implementation, integration testing , Packaging, configuration management

Unit- III

Hardware Platforms: Types of hardware platforms ; Single board computers, PC add-on cards, custom-built hardware plat forms. 89C51; architecture instruction set and programming. AVR microcontroller development board , PIC microcontrollers. 16F84 architecture, instruction set and programming .

Unit- IV

Communication interfaces: Need for communication interface, RS 232/USART. RS422/RS485 .USB Infrared, IEEE 1394 Fire wire, IEEE 802.11, Blue tooth

Unit- V

Embedded/ Real -time operating system concepts: Architecture of the Kernel, Task and task scheduler, Interrupt services routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion Problem , Case studies :RT Linux.

REFERENCES:

1 Frank Vahid and Tony Givargis, *Embedded System Design*: *A Unified Hardware/Software Introduction*, Wiley, 2002

2 David E. Simon, *An Embedded Software Primer,* Pearson Education, 2002

3 Jack Ganssle, *The Art of Designing Embedded Systems*, 2nd ed., Elsevier, 2008.

4 Raj Kamal, *Embedded systems -Architecture, Programming and Design*, Tata McGraw Hill, 2007.