NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution – Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI – 628 503
www.nec.edu.in

REGULATIONS - 2013

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABI OF

M.E. – COMPUTER SCIENCE AND ENGINEERING

REGULATIONS - 2013

Curriculum and Syllabi of Full Time

M.E. (COMPUTER SCIENCE AND ENGINEERING)

SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC11	Discrete Structures and Formal Languages	3	1	0	4
2	CEC12	Data Structures and Algorithms	3	0	0	3
3	CEC13	Advanced Computer Architecture (Common to CSE, CC)	3	0	0	3
4	CEC14	Network and Management Systems	3	0	0	3
5	CEC15	Object Oriented Software Engineering	3	0	0	3
PRACTICAL						
6	CEC16	Data Structures Laboratory	0	0	3	2
7	CEC17	Networking Laboratory	0	0	3	2
		TOTAL	**15**	**1**	**6**	**20**

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC21	Advanced Databases	3	0	0	3
2	CEC22	Advanced Operating Systems	3	0	0	3
3	CEC23	Compiler Design	3	0	0	3
4	CEC24	Internet Programming	3	0	0	3
5		Elective – I	3	0	0	3
6		Elective – II	3	0	0	3
PRACTICAL						
7	CEC25	Operating System and Compiler Laboratory	0	0	3	2
8	CEC26	Internet Programming Laboratory	0	0	3	2
		TOTAL	**18**	**0**	**6**	**22**

SEMESTER III

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
1		Elective – III	3	0	0	3
2		Elective – IV	3	0	0	3
3		Elective – V	3	0	0	3
		PRACTICAL				
4	CEC31	Project Work (Phase I)	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER IV

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	CEC41	Project Work (Phase II)	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE - 69

REGULATIONS - 2013
M.E. (COMPUTER SCIENCE AND ENGINEERING)

CURRICULUM I TO VI SEMESTERS (PART TIME)

SEMESTER - I (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC11	Discrete Structures and Formal Languages	3	1	0	4
2	CEC12	Data Structures and Algorithms	3	0	0	3
3	CEC13	Advanced Computer Architecture (Common to CSE, CC)	3	0	0	3
PRACTICAL						
4	CEC16	Data Structures Laboratory	0	0	3	2
		TOTAL	**9**	**1**	**3**	**12**

SEMESTER - II (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC21	Advanced Databases	3	0	0	3
2	CEC22	Advanced Operating Systems	3	0	0	3
3	CEC23	Compiler Design	3	0	0	3
PRACTICAL						
4	CEC25	Operating System and Compiler Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER - III (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC14	Network and Management Systems	3	0	0	3
2	CEC15	Object Oriented Software Engineering	3	0	0	3
PRACTICAL						
3	CEC17	Networking Laboratory	0	0	3	2
		TOTAL	**6**	**0**	**3**	**8**

SEMESTER - IV (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CEC24	Internet Programming	3	0	0	3
2		Elective – I	3	0	0	3
3		Elective – II	3	0	0	3
PRACTICAL						
4	CEC26	Internet Programming Laboratory	0	0	3	2
		TOTAL	**9**	**0**	**3**	**11**

SEMESTER - V (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1		Elective – III	3	0	0	3
2		Elective – IV	3	0	0	3
3		Elective – V	3	0	0	3
PRACTICAL						
4	CEC31	Project Work (Phase I)	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER - VI (Part time)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	CEC41	Project Work (Phase II)	**0**	**0**	**24**	**12**
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE – 69

LIST OF ELECTIVES FOR M.E.COMPUTER SCIENCE AND ENGINEERING
II SEMESTER ELECTIVE SUBJECTS

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CEE2A	Bio Informatics	3	0	0	3
2.	CEE2B	Grid and Cloud Computing	3	0	0	3
3.	CEE2C	Advanced Network Security (Common to CSE, CS)	3	0	0	3
4.	CEE2D	Adhoc Networks (Common to CSE, CS and CC)	3	0	0	3
5.	CEE2E	Wavelets and multiresolution analysis (Common to CS, CSE)	3	0	0	3
6.	CEE2F	Soft Computing (Common to CSE, CS and CC)	3	0	0	3
7.	CEE2G	Distributed Computing (Common to CSE, CC)	3	0	0	3
8.	CEE2H	Pervasive Computing (Common to CSE, CC)	3	0	0	3
9.	CEE2J	Digital Imaging (Common to CSE, CC)	3	0	0	3
10.	CEE2K	Theory of Computation	3	0	0	3
11.	CEE2L	Software Project Management	3	0	0	3

III SEMESTER ELECTIVE SUBJECTS

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CEE3A	Embedded Systems (Common to CS, CSE and CC)	3	0	0	3
2.	CEE3B	Pattern Recognition (Common to CSE, CS)	3	0	0	3
3.	CEE3C	Evolutionary Computing (Common to HVE, CSE, CS and CC)	3	0	0	3
4.	CEE3D	Mobile Computing (Common to CSE, CS)	3	0	0	3
5.	CEE3E	Security in Wireless Sensor Networks (Common to CSE, CS and CC)	3	0	0	3
6.	CEE3F	Methods for Selfish Malicious Node Detection	3	0	0	3
7.	CEE3G	Cross Layered Wireless ADHOC and Sensor Networks	3	0	0	3
8.	CEE3H	Modeling and Simulation of Wireless Systems (Common to CSE, CC)	3	0	0	3
9.	CEE3J	XML and Web Services (Common to CSE, CC)	3	0	0	3
10.	CEE3K	Data Warehousing and Data Mining	3	0	0	3
11.	CEE3L	Software Quality Assurance	3	0	0	3
12.	CEE3M	Ontology and Semantic Web	3	0	0	3
13.	CEE3N	Information Retrieval Techniques	3	0	0	3
14.	CEE3P	Performance Evaluation of Computer Systems and Networks	3	0	0	3
15.	CEE3Q	Agent Based Intelligent Systems	3	0	0	3
16.	CEE3R	Visualization Techniques	3	0	0	3
17.	CEE3S	Component Based Technology	3	0	0	3
18.	CEE3T	Game Theory	3	0	0	3
19.	CEE3V	Network Congestion Control Avoidance Technique	3	0	0	3
20.	CEE3W	Trusted services and public key infrastructure	3	0	0	3
21.	CEE3X	Wireless MAN	3	0	0	3
22.	CEE3Y	Advanced Security Mechanism	3	0	0	3
23.	CEE3Z	Security on Distributed Systems	3	0	0	3

CEC11   DISCRETE STRUCTURES AND FORMAL LANGUAGES   LT P C
**   3 1 0 4**

OBJECTIVES

- To apply rules of inference to construct proofs in propositional and predicate logic.
- To describe, select and use common proof techniques including mathematical induction.
- To make the students to learn the basic terminology of sets, counting, relations, propositions, and predicates.
- Design state machines for a range of computational problems
- Apply discrete mathematical techniques to problems in computer science

UNIT I   MATHEMATICAL LOGIC   12
Propositions and logical operators – Truth table – Equivalences and implications – Basic laws– Some more connectives – Functionally complete set of connectives – Normal forms – Proofs in Propositional calculus.

UNIT II   SET THEORY   12
Sets – Basic Definitions – Set operations – Laws of set theory – Principles of inclusion and exclusion – Relations – Properties of relations – Equivalence relation – Partitions – Closure operations on relations – Functions: Injective – Surjective – Bijective.

UNIT III   FORMAL LANGUAGES   12
Languages and Grammars – Phrase Structure Grammar – Classification of Grammars – Pumping Lemma for Regular Languages – Context Free Languages.

UNIT IV   FINITE STATE AUTOMATA   12
Finite State Automata – Deterministic Finite State Automata(DFA) – Non Deterministic Finite State Automata (NFA) – Equivalence of DFA and NFA – Equivalence of NFA and Regular Languages.

UNIT V   GRAPH THEORY   12
Graphs – Graph terminology and special types of graphs – Graph isomorphism – Connectivity – Euler and Hamiltonian graphs.

L: 45   T: 15   TOTAL: 60

REFERENCES
1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill, 2011.
2. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Narosa Publishing House, 2006.
3. J.P.Trembly, R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 2nd Edition, Tata McGraw Hill, 1987.
4. Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science", 2nd Edition, Prentice Hall India Pvt. Ltd, 2006.
5. A.Tamilarasi, A.M.Natarajan, "Discrete Mathematics and its Application", 3rd Edition, Khanna Publishers, 2005.
6. Dr. M. K. Venkatraman, Dr. N. Sridharan and N. Chandrasekaran, "Discrete Mathematics", 1st Edition, National Publishing Company, Chennai, 2000.

CEC12   DATA STRUCTURES AND ALGORITHMS   L T P C
                                                                          3 0 0 3

OBJECTIVES
- The fundamental design, analysis and implementation of basic data structures.
- To understand the heap structure and advanced tree structure.
- To understand the applications of data structure.

UNIT I   COMPLEXITY ANALYSIS AND ELEMENTARY DATA STRUCTURES   9
Asymptotic notations – Properties of big oh notation – Asymptotic notation with several parameters – Conditional Asymptotic notation – Amortized Analysis – Solving recurrence equations – Arrays – Linked lists – Stack – Queues.

UNIT II   HEAP STRUCTURES   9
Min-Max heaps – Deaps – Leftist heaps – Binomial heaps – Fibonacci heaps – Skew heaps – Lazy–binomial heaps.

UNIT III   SEARCH STRUCTURES   9
Tree Traversals – Binary trees – Binary search trees – AVL trees – B-trees – 2-3 trees – 2-3-4 trees – Red-black trees – Splay trees – Tries.

UNIT IV   GREEDY AND DIVIDE AND CONQUER   9
Greedy Algorithm – Quick sort – Strassen's matrix multiplication – Convex hull – Tree-vertex splitting – Job sequencing with deadlines – Optimal storage on tapes.

UNIT V   DYNAMIC PROGRAMMING AND BACKTRACKING   9
Multistage graphs – 0/1 Knapsack using dynamic programming – Flow shop scheduling – 8-queens problem – Branch and Bound: Graph colouring – Knapsack using backtracking – Travelling salesman problem.

                                                                          TOTAL: 45

REFERENCES
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Impression, Pearson Education, 2009.
2. E. Horowitz, S. Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", Galgotia, Reprint 2009.
3. Thomas H. Corman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", 2nd Edition, McGraw Hill Publisher, 2001.
4. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", 2nd Edition, Silicon Press, 2007.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals Computer Algorithms", Galgotia, Reprint 2010.

CEC13   ADVANCED COMPUTER ARCHITECTURE   L T P C
(Common to CSE, CC)   **3 0 0 3**

OBJECTIVES
- To understand quantitative and qualitative approaches and analyze various modules of modern computer systems.
- Students will learn about the efficiency of cache memory.
- Students will also learn how many processors synchronously execute instructions to improve performance of a computer system.

UNIT I   FUNDAMENTALS OF COMPUTER DESIGN AND PIPELINING   9
Introduction – Measuring and reporting performance – Quantitative principles of computer design – Instruction set principles – Classifying ISA – Design issues – Pipelining – Basic concepts – Hazards – Implementation – Multicycle operations.

UNIT II   DYNAMIC APPROACHES   9
Concepts – Dynamic Scheduling – Dynamic hardware prediction – Multiple issues – Hardware based speculation – Limitations of ILP.

UNIT III   SOFTWARE APPROACHES   9
Compiler techniques for exposing ILP – Static branch prediction – VLIW – Advanced compiler support – Hardware support for exposing more parallelism – Hardware versus software speculation mechanisms.

UNIT IV   MEMORY AND I/O   9
Cache performance – Reducing cache miss penalty and miss rate – Reducing hit time – Virtual Memory – Buses – RAID – I/O performance measures – Designing an I/O system.

UNIT V   MULTIPROCESSORS AND MULTICORE ARCHITECTURES   9
Symmetric and distributed shared memory architectures – Performance issues – Synchronization issues – Models of memory consistency – Software and hardware multithreading.

TOTAL: 45

REFERENCES
1. John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", 5th Edition, Morgan Kaufmann Publishers, 2011.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 9th Edition, Pearson Education, 2012.
3. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A hardware / software approach", 1st Edition, Morgan Kaufmann Publishers, 1999.
4. Behrooz Parhami, "Computer Architecture", Oxford University Press, 2011.
5. John P. Hayes, "Computer Architecture and Organization", 3rd Edition, Tata McGraw Hill, 1997.
6. Douglas E. Comer, "Essentials of Computer Architecture", 1st International Edition, Pearson Education, 2005.

CEC14   NETWORK AND MANAGEMENT SYSTEMS   L T P C
**   3 0 0 3**
OBJECTIVES
- To make the students to learn the basics of network management systems and the features of Wireless LANs.
- To provide an up-to-date survey of developments in high speed networks
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- To study different types of tools for different applications.

UNIT I   DATA COMMUNICATION AND NETWORK MANAGEMENT   9
Analogy of Telephone Network Management – Distributed Computing Environments – Communications protocols, standards – Case histories of Networking and Management – Challenges of Information Technology Managers – Network Management Goals – Organization and Functions – Network and System management – Network Management System Platform – Current status and Future of Network management.

UNIT II   SNMP   9
Standard, Models and Language – SNMPv1 Network Management: Organization – Information, Communication and Functional model – SNMPv2: System Architecture – Structure of Management Information – SNMPv2 Protocol – SNMpv3: Documentation Architecture – Applications.

UNIT III   RMON MANAGEMENT   9
RMON – Remote Monitoring – RMON SMI, MIB – RMON1 – RMON2 – ATM remote monitoring – Case study of internet traffic using RMON.

UNIT IV   BROADBAND AND TMN NETWORK MANAGEMENT   9
Broadband Access Networks and Technologies – WiMAX and other Broadband Wireless Technologies – HFC Technology – HFC management – DSL technology – Asymmetric Digital Subscriber line Technology – Telecommunication management network – TMN Conceptual Model – TMN standards – TMN Architecture – TMN management service architecture Implementation issues.

UNIT V   NETWORK MANAGEMENT TOOLS AND SYSTEMS   9
Network Management Tools – Network Statistics Measurement Systems – History of Enterprise Management – Network Management Systems – Commercial Network Management Systems – System Management – Network Management Applications – Fault management – Performance Management – Security Management.

**   TOTAL: 45**
REFERENCES
1. Mani Subramanian, "Network Management – Principles and Practice", 4th Indian Reprint, Pearson Education, 2003.
2. Douglas Mauro, Schmidt, "Essential SNMP", 2nd Edition, O'Reilly Media, 2005.
3. William Stallings, "SNMP, SNMPv2, SNMPv3, and RMON 1 and 2", 3rd Impression,   Addison Wesley, 2009.
4. Greg Shields, "Network Management for the mid market", 1st Edition, Real Time Publishers, 2006.
5. Jeffrey G. Andrews, "Fundamentals of WiMAX: Understanding Broadband Wireless Networking", 1st Edition, Prentice Hall, 2007.
6. Dave Zeltserman, "Practical Guide to Snmpv3 and Network Management", 2nd Edition, Prentice Hall, 2000.

CEC15   OBJECT ORIENTED SOFTWARE ENGINEERING   L T P C
                                                                                 3 0 0 3

OBJECTIVES
- To learn object oriented analysis and design using UML and other techniques.
- To learn how object oriented languages support abstraction and polymorphism.
- To learn an agile software process, with multiple iterations, design patterns, test-driven development and pair programming.
- To improve analyzing skills in the context of software development.

UNIT I   INTRODUCTION   9
System concepts – Software Engineering concepts – Development Activities – Managing Software Development – Unified Modeling Language – Project Organization – Communication.

UNIT II   ANALYSIS   9
Requirements Elicitation – Concepts – Activities – Management – Analysis Object Model – Analysis Dynamic Models.

UNIT III   SYSTEM DESIGN   9
Decomposing the system – Overview of system design – System design concepts – System design activities – Addressing design goals – Managing system design.

UNIT IV   OBJECT DESIGN AND IMPLEMENTATION ISSUES   9
Reusing Pattern Solutions – Selecting design patterns and components - Specifying Interfaces – Mapping Models to Code – Testing – Testing activities – Managing Testing.

UNIT V   CHANGE MANAGEMENT   9
Rationale Management – Configuration Management – Project Management – Software development Life Cycle – IEEE Standards for developing life cycle process – Characterizing the Maturity of Software Life Cycle Models.

                                                                                                  TOTAL: 45

REFERENCES
1. Bernd Bruegge, Alan H Dutoit, "Object Oriented Software Engineering", 3rd Edition, Pearson Education, 2005.
2. Craig Larman, "Applying UML and Patterns", 3rd Edition, Pearson Education, 2005.
3. Stephan R. Schach, "Software Engineering", 7th Edition, Tata Mc Graw Hill, 2007.
4. Stephan R. Schach, "Object oriented software engineering", 1st Edition, Tata McGraw Hill, 2004.
5. Roger Pressman, "Software Engineering", 6th Edition, Tata McGraw Hill, 2005.
6. Timothy C. Lethbridge, Robert Laganiere, "Object-Oriented Software Engineering practical software development using UML and Java", 1st Edition, Tata McGraw Hill, 2006.

CEC16   DATA STRUCTURES LABORATORY   **L T P C**
                                                                 0 0 3 2

OBJECTIVES
- To learn how to implement basic concepts of data structures.
- To understand the effect of data structures on an algorithm's complexity.
- To understand and implement the heap and advanced tree structure.

List of Experiments:

1. Write a program to implement Quick Sort.

2. Write a program to implement the following operations in the Binary Tree: a) Insert data b) Delete data   c) Preorder traversal   d) Inorder Traversal e) Postorder Traversal.

3. Write a program to implement the following operations of Deap structure: a) Insert the given data and display the tree b) Delete the data and display the restructured tree.

4. Write a program to implement the Min Heap Structure with the insertion of the given data, delete the minimum value data and display the tree.

5. Write a program to implement the Leftist tree with the following operations: a) Insert a value b) Delete the value c) Display the tree.

6. Write a program to implement the following operations with AVL Tree: a) Insert the data b) LL Rotation c) RR Rotation d) LR Rotation e) RL Rotation f) Delete the data g) Display the tree.

7. Write a program to implement the tries with the following operations: a). create a trie structure using characters of key value left to right, one at a time, b). Insert a character   c). Delete a character.

8. Write a program to implement the convex hull structure and display the convex polygon.

9. Write a program to find out the optimal solution for the given number of objects and their associated weights using Dynamic Programming.

10. Write a program to colour the vertices, where no two vertices should have the same colour for the given number of vertices and colours.

TOTAL: 45

Required Software: C++ and Java

CEC17   **NETWORKING LABORATORY**   **L T P C**
                                                                0 0 3 2

OBJECTIVES
- To study the various network programming and socket system calls.
- To study the TCP/UDP Protocol and their applications.
- To understand the concepts of data transfer between client and server.
- To simulate various networking protocols.

List of Experiments:

1. Write a java program to show the date and time to server using TCP.

2. Develop a java program for a client-server application for chat using TCP.

3. Write a program to implement Echo client server using TCP/IP.

4. Write a Java program to develop a DNS server to resolve the given Hostname.

5. Write a program to implement connectionless chat application.

6. Write a java RMI program to perform Prime number generation.

7. Write a java program to simulate sliding window protocol.

8. Develop a Java program to simulate Address Resolution Protocol.

9. Simulate Routing Protocol using Border Gateway Protocol(BGP).

10. Simulate the Open Shortest Path First (OSPF) routing protocol based on the cost assigned to the path.

11. Implement a server that provides processing services to two or more clients. The services may include computation of factorial of an integer and computation of power a, b where a and b belong to double data type using Remote Procedure Call.

12. Study of Network Simulator Package – NS2

13. To perform the following exercise using NS2

    i. To create a script that simulates the simplest network topology.

    ii. To write a script to simulate a simple network used in an Educational Institution.

    iii. To create a simple TCP scenario with Drop Tail Queue mechanism on the gateway.

    iv. To create a complex topology and simulate a link failure.

                                                                TOTAL: 45

Required Software: Java and NS2

CEC21   **ADVANCED DATABASES**   **L T P C**
                                                                      3 0 0 3

OBJECTIVES
- To understand the importance of distributed databases and their architectures.
- To study the concepts of object and relational databases.
- To learn the spatial, temporal, mobile and multimedia databases.

UNIT I   DISTRIBUTED DATABASES   10
Distributed Database Concepts – Design Issues – Architecture – Fragmentation – Distributed Query Processing – Optimization of Distributed Queries – Distributed Transactions – Concurrency Control – Data Replication.

UNIT II   OBJECT RELATIONAL DATABASES   10
Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards – Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended Relational Systems: Object Relational features in Oracle SQL.

UNIT III   SPATIAL AND TEMPORAL DATABASES   8
Spatial Databases: Introduction – Spatial Representation – Data Types – Relationships – Access Methods – Indexing. Temporal Databases: Motivation – Indexing – Snapshot index. Spatiotemporal databases.

UNIT IV   MOBILE DATABASES   8
Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models – Concurrency Control – Transaction Commit Protocols – Mobile Database Recovery Schemes.

UNIT V   MULTIMEDIA DATABASES   9
Multidimensional Databases – Image Databases – Text/Document Databases – Video Database – Audio Databases – Multimedia Database Design.

TOTAL: 45

REFERENCES
1. M.Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", 3rd Edition, Pearson Education, 2011.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", 6th Edition, Pearson Education, 2010.
3. Henry F Korth, Abraham Silberschatz and S. Sudharshan, "Database System Concepts",   6th Edition, McGraw Hill, 2010.
4. Thomas Cannolly, Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", 3rd Edition, Pearson Education, 2007.
5. Philippe Rigaux, Michel O. Scholl and Agnes Voisard, "Spatial Databases: with Applications to GIS", 2nd Edition, Morgan Kaufmann Publishers, 2002.
6. V. S. Subramanian, "Principles of Multimedia Database Systems", 2nd Edition, Harcourt India Pvt Ltd., 2004.

CEC22   **ADVANCED OPERATING SYSTEMS**   **L T P C**
                                                          3 0 0 3

OBJECTIVES
- To understand the mechanisms for synchronization.
- Provide knowledge in the distributed operating systems.
- To study the concept of distributed file systems.
- To know about the failures and the recovery mechanisms for failure.

UNIT I   INTRODUCTION   10
Overview of processes – Processor – Inter Process communication – Critical section – Semaphores – Process scheduling – Performance evaluation – Deadlocks: Prevention – Avoidance – Detection – Recovery.

UNIT II   STORAGE MANAGEMENT   10
Management strategies – Contiguous and non-contiguous storage allocation – Fixed partition multi-programming – Variable partitions – Swapping. Virtual storage – Multilevel organization – Block mapping – Paging – Segmentation – Page replacement – Locality-working sets – Demand Paging – Anticipatory Paging – Page release – Page size – Program behavior under Paging.

UNIT III   FILE SYSTEMS   8
Structures, types – File operations – Memory mapped files – Hierarchical directory systems – File system implementation – Shared files – Protection and security – File systems design in Linux, windows.

UNIT IV   DISTRIBUTED OPERATING SYSTEMS   10
Introduction – Issues in Distributed Operating System – Hardware and software concepts – Multiprocessor time sharing system – Layered protocols – Client server model – Remote Procedure Calls – Distributed Mutual Exclusion.

UNIT V   THREADS AND DISTRIBUTED FILE SYSTEMS   7
Inherent Limitations of a Distributed systems – Clock Synchronization Algorithms – Threads – Design Issues of Threaded Packages – Design and implementation issues of processor allocation algorithms – Distributed file system.

                                                          TOTAL: 45

REFERENCES
1. Abraham Silberschatz, James Peterson and Peter Baer Galving, "Operating System Concepts", 6th Edition, Addison Wesley Publishing Company, 2006.
2. Milenkovich .M, "Operating Systems: Concepts and Design", 2nd Edition, McGraw Hill Publishing Company, 2000.
3. Andrew .S. Tannenbaum, "Modern Operating System", 3rd Edition, Prentice Hall, 2008.
4. Mukesh Singhal, "Advanced Concepts in Operating Systems", 3rd Edition, McGraw Hill Publishing Company, 2004.
5. She Tov Levi, Ashok K.Agarwal, "Real Time System Design", 1st Edition, McGraw Hill Publishing Company, 2004.
6. William Stallings, "Operating systems", 7th Edition, Pearson Education, 2012.

CEC23   **COMPILER DESIGN**   **L T P C**
                                                                             3 0 0 3
OBJECTIVES
- To understand the concepts of language translation and compiler design.
- To recognize the underlying formal models such as finite state automata and their connection to language definition through regular expressions and grammars.
- To learn about the effectiveness of optimization.

UNIT I   INTRODUCTION   8
Basics of Compiler – Analysis of the source program – Phases of a compiler – Cousins of the compiler – The grouping of phases – Compiler-construction tools. Simple One-Pass Compiler: Overview – Syntax definition – Syntax-directed translation – Parsing – A translator for simple expressions – Lexical analysis – Incorporating a symbol table.

UNIT II   LEXICAL ANALYSIS   10
Role of Lexical Analyzer – Input buffering – Token Specification – Recognition of tokens – Lexical Analyzer Generator Lex – Finite automata – Regular expression to NFA – Regular expression to DFA – NFA to DFA – Optimization of DFA. Syntax Analysis: Role of Parser – Context Free Grammars – Top down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom up parsing – Shift Reduce parsing – Operator-precedence parsing – LR parsers.

UNIT III   SYNTAX DIRECTED TRANSLATION   9
Syntax directed translation: Syntax directed translation schemes, Implementation of syntax directed translators – Intermediate code – Postfix notation – Parse trees and syntax trees. Three address code: quadruple and triples. Translation of language constructs: assignment statements – Boolean expressions – Control Statements – Back patching.

UNIT IV   CODE GENERATION   9
Issues in the design of code generator – The target machine – Runtime storage management –Basic blocks and flow graphs – Next-use information – Simple code generator – DAG representation of basic blocks – Peephole optimization.

UNIT V   CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS   9
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 – Parameter Passing.

TOTAL: 45

REFERENCES
1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry. D. Ullman, "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson Publishing Company, 2007.
2. Allen I. Holub "Compiler Design in C", 2nd Edition, Prentice Hall of India, 2003.
3. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", 2nd Edition, Benjamin Cummings, 2003.
4. J. P. Bennet, "Introduction to Compiler Techniques", 2nd Edition, Tata McGraw Hill, 2003.
5. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", 1st Edition, Prentice Hall of India, 2001.
6. Kenneth C. Louden, "Compiler Construction: Principles and Practice", 1st Edition, Thompson Learning, 2003.

CEC24   **INTERNET PROGRAMMING**   **L T P C**
                                                                         3 0 0 3

OBJECTIVES
- To understand the client and server concepts.
- To study client side scripting languages for design of GUI based applications.
- To study server side programming languages and remote services.
- To provide technical knowledge on web based system development.

UNIT I   INTRODUCTION   9
Internet Protocols: ICMP, IGMP, UDP, TCP/IP, HTTP – POP, SMTP – URL – MIME – Domain Name System. Markup languages: HTML – XHTML. Image Mapping – Web page design.

UNIT II   DYNAMIC HTML   9
Dynamic HTML: Introduction – Cascading style sheets – Z-Index – Visibility – Positioning – Object model and collections – Event model – Filters and Transitions – Data binding – Data control.

UNIT III   SCRIPTS AND APPLETS   9
JavaScript: Introduction – Control Structures – Functions – Arrays – Objects – Simple Web Applications – Applets – Life Cycle – Events – Layouts.

UNIT IV   SERVLETS   9
Servlets: Deployment of simple Servlets – Web Server (Java Web Server / Tomcat / Web logic) – HTTP GET and POST requests – Session Tracking – Cookies – JDBC – Development of Web Applications.

UNIT V   ASP AND JSP   9
ASP Basics – ASP Objects – ASP applications. JSP: JSP Basic Programming – JSP objects – Applications – PHP – MySQL.

                                                                         TOTAL: 45

REFERENCES

1. Harvey M. Deitel, Paul J. Deitel and Abbey Deitel, "Internet and World Wide Web - How to program", 5th Edition, Pearson Education Publishers, 2012.
2. Jeffrey C Jackson, "Web Technology – A computer Science perspective", 2nd Edition, Pearson Education, 2007.
3. Chris Bates, "Web Programming – Building Internet Applications", 3rd Edition, Wiley India, 2006.
4. R. Krishnamoorthy and S. Prabhu, "Internet and Java Programming", 1st Edition, New Age International Publishers, 2004.
5. Thomos A. Powell, "The Complete Reference HTML and XHTML", 4th Edition, Tata McGraw Hill, 2003.
6. Herbert Schildt, "The Complete Reference - Java2", 8th Edition, McGraw Hill Osborne Media, 2011.

CEC25   OPERATING SYSTEM AND COMPILER LABORATORY   L T P C
0 0 3 2

OBJECTIVES
- To implement semaphores and multithreading.
- To implement the concurrency conflict that occurs between multiple client applications
- To implement Lexical Analysis phase and various parsing algorithms

List of Experiments:

1. To simulate the following CPU Scheduling Algorithms

   a) FCFS   b) SJF   c) Priority   d) Round Robin

2. To simulate Bankers algorithm for Deadlock Avoidance

3. To simulate Bankers Algorithm for deadlock Prevention

4. To simulate the following Page Replacement Algorithms

   a) FIFO   b) LRU

5. To simulate the Best Fit Algorithm for   Memory Management

6. To develop the inter process communication using following concepts

   a) Pipes   b) Message Passing   c) Shared Memory

7. To simulate the following file allocation strategies

   a) Sequential   b) Indexed   c) Linked

8. To implement the Lexical Analyzer to identify token present in the input file using java.

9. To implement the Finite Automate Construction from Regular Expression using java.

10. To construct SLR Parsing table for the given Grammar.

11. To construct CLR (1) items of the input Grammar

12. To generate Assembly code for the intermediate code using java.

TOTAL: 45

Required Software: Java and Linux / Windows

CEC26   **INTERNET PROGRAMMING LABORATORY**   **L T P C**
                                                                  0 0 3 2

OBJECTIVES
- To design web pages using client side scripting languages and DHTML.
- To implement server side languages like Servlets, JSP and ASP.
- To develop web services and E-business applications.

List of Experiments:

1. Design a web page with registration form using Navigation Frames in HTML.

2. Design a Web Pages using Java Script.

3. Develop a web application using CSS and DHTML for designing web site for an engineering college.

4. Design and develop an payroll processing application using Servlets

5. Implement a web based tutorial system using JDBC

6. Implement an application for Job portal using ASP

7. Design an online shopping web site using JSP

8. Develop web services for Telemedicine application.

9. Develop an e-learning portal application using XML

10. Implement an internet banking application using XML Database.

11. Web Customization.

12. Develop an E-Business Application.

                                                                  TOTAL: 45

Required Software: Java, XML, HTML and Scripting languages

CEE2A   **BIO INFORMATICS**   **L T P C**
                                                                                3 0 0 3

OBJECTIVES
- To learn the process of search engines and data visualization.
- To study the statistical concepts and data analysis.
- To know about the pattern matching algorithms and simulation methods.

UNIT I   INTRODUCTORY CONCEPTS   9
The Central Dogma – The Killer Application – Parallel Universes – Watson's Definition – Top Down versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security.

UNIT II   SEARCH ENGINES AND DATA VISUALIZATION   9
Search Process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – Sequence Visualization – Structure Visualization – User Interface – Animation versus Simulation – General Purpose Technologies.

UNIT III   STATISTICS AND DATA MINING   9
Statistical Concepts – Microarrays – Randomness – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization.

UNIT IV   PATTERN MATCHING   9
Pairwise Sequence Alignment – Local versus Global Alignment – Multiple sequence alignment – Computational methods – Dot Matrix Analysis – Substitution Matrices – Dynamic Programming – Word Methods – Bayesian Methods – Multiple Sequence Alignment – Dynamic Programming – Progressive Strategies – Iterative Strategies – Tools – Nucleotide Pattern Matching.

UNIT V   MODELING AND SIMULATION   9
Drug Discovery – components – process – Perspectives – Numeric considerations –   Algorithms – Hardware – Issues – Protein Structure – AbInitio Methods – Heuristic Methods – Systems Biology – Tools – Collaboration and Communications – Standards – Issues – Security – Intellectual Property – Case Study under Genomic medicine – Telemedicine.

                                                                        TOTAL: 45

REFERENCES
1. Bryan Bergeron, "Bio Informatics Computing", 2nd Edition, Pearson Education, 2003.
2. T.K.Attwood and D. J. Perry Smith, "Introduction to Bio Informatics", 3rd Edition, Longman Essen, 2002.
3. Sumeet Dua, Pradeep Chowriappa**, "**Data mining for Bioinformatics", 1st Edition, CRC Press, 2012.
4. Hooman Rashidi, Lukas K. Buehler, "Bioinformatics Basics: Applications in Biological Science and Medicine Edition", 2nd Edition, CRC Press, 2005.
5. Andreas D. Baxevanis, B. F. Francis Ouellette, "Bioinformatics: A Practical Guide to the Analysis of Genes and Protein", 3rd Edition, Wiley, John & Sons, 2004.

CEE2B	GRID AND CLOUD COMPUTING	L T P C
		3 0 0 3

OBJECTIVES
- To know the basic concepts in grid computing.
- To learn the grid services architecture.
- To understand the abstract nature of cloud computing.
- To study about the web based applications in cloud environment.
- To study the technologies and tool kit for grid and cloud computing.

UNIT I   FUNDAMENTALS OF GRID COMPUTING   9
Scope of Grid Computing – Desktop grids – Data grids – Applications of Grid computing. Grid Computing Architecture – Grid computing anatomy – Next generation of Grid Computing Initiatives– Merging the grid services architecture with Web services architecture.

UNIT II   GRID COMPUTING TECHNOLOGIES   9
OGSA – Sample Use Cases – OGSA Platform Components – OGSI and WSRF – OGSA Basic Services. Tool Kits: Globus GT3 Toolkit – Architecture – Programming Model – UNICORE – Pegasus.

UNIT III   FUNDAMENTALS OF CLOUD COMPUTING   9
Fundamentals – Cloud Architecture – Cloud Storage – Matters – Cloud Services – Companies on cloud today – Pros and cons.

UNIT IV   CLOUD SERVICES   9
Need for Web Based Application – Types of cloud Service Development – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Calenders.

UNIT V   APPLICATIONS AND TOOLS   9
Online Planning and Task management – Event Management – Contact management – Tools management – Tool kits: Hadoop – Map reduce – OpenStack – CloudSim.

TOTAL: 45

REFERENCES
1. Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", 1st Edition, Charles River Media, 2006.
2. Ian Foster, Carl Kesselman, "The Grid2: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufman, 2004.
3. Frederic Magoules, Jie Pan, Kiat-An Tan and Abhinit Kumar, "Introduction to Grid Computing", 1st Edition, CRC Press, 2009.
4. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", 1st Edition, John Wiley & Sons, 2010.
5. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, "Cloud Computing, A Practical Approach", 1st Edition, McGraw Hill Osborne Media, 2009
6. Kris Jamsa, "Cloud Computing**",** 1st Edition, Jones & Bartlett Publishers, 2012.

CEE2C	ADVANCED NETWORK SECURITY	L T P C
	(Common to CSE and CS)	3 0 0 3

OBJECTIVES
- To know about various network attacks and challenges.
- To study the security algorithms.
- To learn web security and wireless security.

UNIT I   INTRODUCTION ON SECURITY   9

Security Goals – Types of Attacks: Passive attack – active attack – attacks on confidentiality – Integrity and availability – Security services and mechanisms – Cryptography Techniques – Steganography.

UNIT II   SYMMETRIC AND ASYMMETRIC KEY ALGORITHMS   9

Substitutional and Transposition Ciphers – Stream and Block Ciphers – Data Encryption Standards (DES) – Advanced Encryption Standard (AES) – RC4 – principle of asymmetric key algorithms – RSA Cryptosystem – Diffie Hellmen Key Exchanging algorithm.

UNIT III   INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT   9

Message Integrity – Hash functions – SHA – Digital signatures – Digital signature standards Authentication – Kerberos – Entity Authentication – Biometrics – Key management Techniques.

UNIT IV   NETWORK SECURITY, FIREWALLS AND WEB SECURITY   9

Introduction on Firewalls – Types of Firewalls – Firewall Configuration and Limitation of Firewall – IP Security Overview – IP security Architecture – authentication Header – Security payload – security associations – Key Management – Web security requirement – secure sockets layer – transport layer security – secure electronic transaction – dual signature.

UNIT V   WIRELESS NETWORK SECURITY   9

Attacks – Routing, Integrity, confidentiality and availability related attacks – Wired Equivalent Privacy, Wi-Fi Protected Access and WPA-2 for Wi-Fi network – Secure Adhoc Network – Secure Sensor Network.

TOTAL: 45

REFERENCES
1. Behrouz A. Fourcuzan, "Cryptography and Network security", 2nd Edition, Tata McGraw Hill, 2008.
2. William Stallings, "Cryptography and Network Security", 3rd Edition, Pearson Education, 2003.
3. Mark D. Ciampa, "Security+ Guide to Network Security Fundamentals", 3rd Edition, Cengage Learning, 2009.
4. Stuart McClure, Joel Scambray and George Kurtz, "Hacking Exposed: Network Security Secrets and Solutions", 6th Edition, McGraw Hill Publications, 2009.
5. Chris McNab, "Network Security Assessment: Know Your Network", 2nd Edition, O'Reilly Media, 2007.
6. Fahim Hussain Yusuf Bhaiji, "Network Security Technologies and Solutions (CCIE Professional Development Series)", 1st Edition, Cisco Press, 2008.

CEE2D	ADHOC NETWORKS	L T P C
	(Common to CSE, CS and CC)	3 0 0 3

OBJECTIVES
- To learn the MAC address spoofing concepts and basics of networks.
- To learn the routing principles and Adhoc network types.
- To learn the IEEE standards, MESH networks and its heterogeneous models.

UNIT I   ADHOC MAC   9
Introduction – Issues in Adhoc Wireless Networks – MAC Protocols – Issues – Classifications of MAC protocols – Multi channel MAC and Power control MAC protocol.

UNIT II   ADHOC NETWORK ROUTING AND TCP   9
Issues – Classifications of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Adhoc Transport Layer Issues. TCP Over Adhoc – Feedback based, TCP with explicit link, TCP-BuS, Adhoc TCP, and Split TCP.

UNIT III   WSN - MAC   9
Introduction – Sensor Network Architecture – Data dissemination – Data Gathering. MAC Protocols– Self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IV   WSN ROUTING, LOCALIZATION AND QoS   9
Issues in WSN routing – OLSR, AODV, DSR, DSDV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

UNIT V   MESH NETWORKS   9
Necessity for Mesh Networks – MAC enhancements – IEEE 802.11's Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

TOTAL: 45

REFERENCES
1. C.Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks: Architectures and Protocols", 1st Edition, Pearson Education, 2004.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", 1st Edition, Morgan Kaufman Publishers, 2004.
3. C.K.Toh, "Adhoc Mobile Wireless Networks", 1st Edition, Pearson Education, 2002.
4. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", 2nd Edition, O'Reilly Publishers, 2007.
5. C K Toh, "Adhoc mobile wireless networks, Protocols and Systems", 2nd Edition, Pearson Education, 2009.
6. Azzedine Boukerche, "Handbook of algorithms for wireless Networking and Mobile computing", 2nd Edition, CRC Press, 2006.

CEE2E   **WAVELETS AND MULTIRESOLUTION ANALYSIS**   **L T P C**
                    (Common to CS and CSE)   **3 0 0 3**

OBJECTIVES:
- To study the mathematical background for the wavelets.
- To study the Multiresolution Analysis.
- To study the Continuous and Discrete wavelet transforms.

UNIT I   INTRODUCTION   9
Vector Spaces, properties, dot product, basis, dimension, orthogonality and orthonormality, relationship between vectors and signals, Signal spaces, concept of Convergence, Hilbert spaces for energy signals, Generalized Fourier Expansion.

UNIT II   CONTINUOUS WAVELET TRANSFORMS   9
Wavelet Transform, definition and properties, concept of scale and its relation with frequency, Continuous Wavelet Transform (CWT), Scaling function and wavelet functions (Daubechies, Coiflet, Mexican Hat, Sinc, Gaussian, Bi-Orthogonal), Tiling of time scale plane for CWT.

UNIT III   MULTI RESOLUTION ANALYSIS   9
Definition of Multi Resolution Analysis (MRA), Haar basis, Construction of general ortho normal MRA, Wavelet basis for MRA, Continuous time MRA interpretation for the DTWT, Discrete time MRA, Basis functions for the DTWT, PRQMF filter banks.

UNIT IV   DISCRETE WAVELET TRANSFORMS   9
Filter Bank and sub band coding principles, Wavelet Filters, Inverse DWT computation by Filter banks, Basic Properties of Filter coefficients, Choice of wavelet function coefficients, Derivations of Daubechies Wavelets, Mallat's algorithm for DWT, Multiband Wavelet transforms.
Lifting Scheme: Wavelet Transform using Polyphase matrix Factorization, Geometrical foundations of lifting scheme, Lifting scheme in Z –domain.

UNIT V   APPLICATIONS   9
Signal Compression, Image Compression techniques: EZW-SPHIT Coding, Image denoising techniques: Noise estimation, Shrinkage rules, Shrinkage Functions, Edge detection and object Isolation, Image Fusion, and Object Detection. Curve and Surface Editing, Variational modeling and finite element method using wavelets.

TOTAL: 45 PERIODS

REFERENCES
1. Rao .R.M and A.S.Bopardikar, "Wavelet Transforms: Introduction to theory and Applications", Pearson Education Asia Pvt. Ltd., 2000.
2. K.P.Soman and K.I.Ramachandran, "Insight into Wavelets – From Theory to practice", 3rd Edition, Prentice- Hall, 2004.
3. Mallat.S, "A wavelet tour of Signal Processing", Elsevier publications, 3rd edition, Academic Press, 2008.
4. Jaideva.C.Goswami, Andrew.K.Chan, "Fundamentals of Wavelets theory, algorithms and applications", 2nd Edition, John Wiley &Sons, 2011.
5. Weeks Michael, "Digital Signal Processing Using MATLAB and Wavelets", Firewall Media, 2011.

CEE2F	**SOFT COMPUTING**	**L T P C**
	(Common to CSE, CS and CC)	**3 0 0 3**

OBJECTIVES
- To understand the concept of soft computing.
- To learn fuzzy logic concepts.
- To learn the different classifications of neural networks.
- To study the concepts of Genetic algorithm and its applications.

UNIT I   SOFTCOMPUTING AND CONVENTIONAL AI   9
Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Derivative based optimization: Descent Methods, Newton's method – Step size determination – Derivative free optimization.

UNIT II   FUZZY SYSTEMS   9
Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions – Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT III   ARTIFICIAL NEURAL NETWORKS   9
Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks.

UNIT IV   NEURO - FUZZY MODELING   9
Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – ANFIS Applications.

UNIT V   GENETIC ALGORITHMS   9
Evolutionary Computation – Genetic Algorithms – Terminologies and Operators of GA – Classification of GA: Simple GA, Parallel and Distributed GA, Adaptive GA – Ant Colony Optimization – Particle Swarm Optimization – Application of GA: Machine Learning, Image Processing, Data Mining and Wireless networks.

TOTAL: 45

REFERENCES
1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", 1st Edition, Prentice Hall of India, 2003.
2. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", 1st Edition, Springer, 2007.
3. S.N.Sivanandam, S.N.Deepa, "Principles of Soft Computing", Wiley & Sons, 2nd Edition, 2007.
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5. S.N.Sivanandam, S.Sumathi and S.N.Deepa, "Introduction to Fuzzy Logic using MATLAB", 1st Edition, Springer, 2007.
6. James A.Freeman and David M.Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", 1st Edition, Pearson Education, 2003.

CEE2G   **DISTRIBUTED COMPUTING**   **L T P C**
                                (Common to CSE and CC)   **3 0 0 3**

OBJECTIVES
- To learn the various paradigms in distributed environment.
- To know about distributed operating systems.
- To study the concept of distributed resource management.
- To understand the concept of fault tolerance system.

UNIT I   COMMUNICATION IN DISTRIBUTED ENVIRONMENT   8
Introduction – Various Paradigms in Distributed Applications – Remote Procedure Call – Remote Object Invocation – Message – Oriented Communication – Unicasting, Multicasting and Broadcasting – Group Communication.

UNIT II   DISTRIBUTED OPERATING SYSTEMS   12
Issues in Distributed Operating System – Threads in Distributed Systems – Clock Synchronization: Logical Clock – Vector Clock – Causal Ordering – Global States – Election Algorithms – Distributed Mutual Exclusion – Distributed Transactions – Distributed Deadlock – Agreement Protocols.

UNIT III   DISTRIBUTED RESOURCE MANAGEMENT   10
Distributed Shared Memory – Data-Centric Consistency Models – Client-Centric Consistency Models – Ivy – Munin – Distributed Scheduling – Distributed File Systems – Sun NFS.

UNIT IV   FAULT TOLERANCE   7
Introduction to Fault Tolerance – Process Resilience – Reliable Client Server Communication – Reliable Group Communication – Distributed Commit Protocols – Failure – Recovery.

UNIT V   DISTRIBUTED OBJECT BASED SYSTEM   8
Distributed Object Based System: Architecture – Communication – Naming – CORBA – Distributed Coordination Based System – Coordination model – Architecture – Content based routing – Synchronization.

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REFERENCES
1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", 3rd Edition, Pearson Education Asia, 2002.
2. Andrew S. Tanenbaum, M. Van Steen, "Distributed Systems", 2nd Edition, Prentice Hall, 2006.
3. Hagit Attiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulations and Advanced Topics", 2nd Edition, Wiley publishers, 2004.
4. Mukesh Singhal, "Advanced Concepts In Operating Systems", 3rd Edition, McGraw Hill, 2004.
5. M. L. Liu, "Distributed Computing Principles and Applications", Fourth Impression, Pearson Education, 2009.

CEE2H	PERVASIVE COMPUTING	L T P C
	(Common to CSE and CC)	3 0 0 3

OBJECTIVES
- To understand the pervasive computing concepts.
- To know the voice standards and speech applications.
- To know the issues in pervasive computing.

UNIT I   INTRODUCTION   9
Pervasive Computing Application – Pervasive Computing devices and Interfaces – Device technology trends, Connecting issues and protocols.

UNIT II   WEB APPLICATIONS   9
Pervasive Computing and web based Applications – XML and its role in Pervasive Computing – Wireless Application Protocol (WAP) Architecture and Security – Wireless Mark-Up language (WML) – Introduction.

UNIT III   SPEECH APPLICATIONS   9
Voice Enabling Pervasive Computing – Voice Standards – Speech Applications in Pervasive Computing and security.

UNIT IV   PDA AND PERVASIVE COMPUTING   9
PDA in Pervasive Computing – Introduction – PDA software Components – Standards – emerging trends – PDA Device characteristics – PDA Based Access Architecture.

UNIT V   ADVANCED CONCEPTS   9
User Interface Issues in Pervasive Computing – Architecture – Smart Card based Authentication Mechanisms – Wearable computing Architecture.

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REFERENCES
1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec and Klaus Rindtorff, "Pervasive Computing Technology and Architecture of Mobile Internet Applications", 1st Edition, Addision Wesley professional, 2002.
2. Uwe Hansman, Lothat Merk, Martin S Nicklous and Thomas Stober, "Principles of Mobile Computing", 2nd Edition, Springer - Verlag, New Delhi, 2003.
3. Rahul Banerjee, "Internetworking Technologies: An Engineering Perspective", 2nd Edition, Prentice Hall of India, 2004.
4. Rahul Banerjee, "Lecture Notes in Pervasive Computing", Outline Notes, BITS-Pilani, 2003.
5. Jochen Burkhardt, Dr. Horst Henn, Stefan Hepper and Klaus Rintdorff, Thomas Schaeck, "Pervasive Computing", 2nd Edition, Addison Wesley, 2009.
6. F.Adelstein, S.K.S. Gupta, "Fundamentals of Mobile and Pervasive Computing", 1st Edition, Tata McGraw Hill, 2005.

CEE2J	DIGITAL IMAGING	L T P C
	(Common to CSE and CC)	3 0 0 3

OBJECTIVES
- To understand the fundamentals of image processing.
- To learn the various image enhancement and segmentation techniques.
- To know the various image compression standards.
- To know the applications of image processing.

UNIT I   FUNDAMENTALS OF IMAGE PROCESSING   9
Elements of digital image processing systems, Elements of visual perception, brightness, contrast, hue, saturation – Color fundamentals and models – Image file formats – Image Acquisition – Sampling and Quantization – Pixel Relationships – Image operations – Morphological Image Processing – Matlab: Basics - Implementation of Image operations.

UNIT II   IMAGE ENHANCEMENT   9
Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT – Smoothing and Sharpening filters – Homomorphic Filtering – Matlab functions of Transformations.

UNIT III   IMAGE SEGMENTATION AND ANALYSIS   9
Color Image Processing – Image Segmentation – Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological WaterSheds – Motion Segmentation, Feature Analysis and Extraction – Implementation of Image Segmentation techniques using Matlab.

UNIT IV   MULTI RESOLUTION ANALYSIS AND COMPRESSIONS   9
Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms. Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards Matlab Implementation of Wavelets and Compression – Matlab: Wavelets Basics – Types – Compression Techniques.

UNIT V   IMAGE REPRESENTATION AND RECOGNITION   9
Image Representation – Boundary Descriptors – Regional Descriptors – Relational Descriptors – Object Recognition – Applications of Image Processing – Matlab Implementation of Object Recognition.

TOTAL: 45

REFERENCES
1. Rafael C.Gonzalez, Richard E.Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2009.
2. S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", 1st Edition, Tata Mc Graw Hill, 2009.
3. Rafael C.Gonzalez, Richard E.Woods and Steven L.Addins, "Digital Image Processing Using MATLAB", 2nd Edition, Pearson Education, 2009.
4. Wilhelm Burger, Mark Burge, "Principles of Digital Image Processing: Fundamental Techniques", 1st Edition, Springer, 2009.
5. Castleman, "Digital Image Processing", 1st Edition Pearson Education, 2007.
6. Anil K.Jain, "Fundamentals of Digital Image Processing", 2nd Edition, Pearson Education, 2003.

CEE2K   **THEORY OF COMPUTATION**   **L T P C**
                                                                             3 0 0 3

OBJECTIVES

- To learn about the finite automata and transitions.
- To study about regular expressions and languages.
- To know the properties of context free grammar and languages.
- To understand the programming techniques for turing machines.

UNIT I   AUTOMATA   9

Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata (FA) – Deterministic Finite Automata – Non deterministic Finite Automata – Finite Automata with Epsilon Transitions.

UNIT II   REGULAR EXPRESSIONS AND LANGUAGES   9

Regular Expression (RE) – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III   CONTEXT FREE GRAMMAR AND LANGUAGES   9

Context Free Grammar (CFG) – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV   PROPERTIES OF CONTEXT FREE LANGUAGES   9

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines (TM) – Programming Techniques for TM.

UNIT V   UNDECIDABILITY   9

A Language that is Not Recursive Enumerable – An Undecidable Problem that is RE – Undecidable Problems about TM – Post's Correspondence Problem – The Class P and NP.

TOTAL: 45

REFERENCES

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Addison Wesley, 2006.
2. Harry R .Lewis and Christos H. Papadimitriou, "Elements of the theory of Computation", 2nd Edition, Prentice Hall of India, 2003.
3. John C. Martin, "Introduction to Languages and the Theory of Computation", 3rd Edition, Tata Mc Graw Hill, 2003.
4. Michael Sipser, "Introduction of the Theory and Computation", 3rd Edition, Thomson Brokecole, 2005.

CEE2L   **SOFTWARE PROJECT MANAGEMENT**   **L T P C**
                                                                   3 0 0 3

OBJECTIVES
- To study the components, tools and techniques of a software system development.
- To understand the emerging models of project management.
- To learn the umbrella and instream activities in project development.
- To learn various challenges in project management.

UNIT I   BASIC CONCEPTS   9
Product, Process and Project – Definition – Components of Software Project Management (SPM) – Challenges and Opportunities – Tools and Techniques – Managing Human Resource and Technical Resource – Costing and pricing of projects – Training and development – Project management technique – Product Life Cycle – Project Life Cycle Models.

UNIT II   FORMAT PROCESS MODELS AND THEIR USE   9
Definition and Format Model for a Process – ISO 9001 and CMM Models and their relevance to Project Management – Other Emerging Models like People CMM.

UNIT III   UMBRELLA ACTIVITIES IN PROJECTS   9
Metrics – Methods and Tools for Metrics – Issues of Metrics in multiple Projects – Configuration Management – Software Quality Assurance – Quality Standards and Certifications – Process and Issues in obtaining Certifications – Risk issues in Software Development and Implementation – Identification of Risks – Resolving and Avoiding risks – Tools and Methods for Identifying Risk Management.

UNIT IV   INSTREAM ACTIVITIES IN PROJECTS   9
Project Initiation – Project Planning – Execution and Tracking – Project Wind up – Concept of Process – Project Database.

UNIT V   ENGINEERING AND PEOPLE ISSUES IN PROJECT MANAGEMENT   9
Phases: Requirements, Design, Development, Testing, Maintenance, Deployment – Engineering Activities and Management Issues in Each Phase – Special Considerations in Project Management for India and Geographical Distribution Issues.

                                                                  TOTAL: 45

REFERENCES
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CEE3A	EMBEDDED SYSTEMS	L T P C
	(Common to CS, CSE and CC)	3 0 0 3

OBJECTIVES
- To study the Embedded processor and its architecture.
- To study the Real-time characteristics and its system design techniques.

UNIT I   EMBEDDED SYSTEM BASICS   9

Embedded Computers, Characteristics of Embedded Computing Applications, and Challenges in Embedded Computing system design, Embedded system design process, Overview of embedded system development – embedded system IDE – ARM Family – Core Types – Memory Mapping – and ARM Based embedded development system.

UNIT II   ARM ARCHITECTURE   9

Organization of CPU – Bus architecture – Memory management unit: virtual memory to physical memory address translation, TLB, Domains and memory access permission, cache and write buffer, single stage and two stage cache accessing, significance of co-processor 15 Fast Context Switch Extension.

UNIT III   EMBEDDED PROGRAMMING AND COMPUTING PLATFORM   9

Embedded software development based on ARM including: ARM basic instruction set, Thumb instruction set – assembly programming – ARM processor mode switching – embedded C programming – C and assembly language mix programming.

UNIT IV   ARM BASIC PERIPHERAL INTERFACING   9

I/O interface concepts – interrupts – types of interrupts – ARM interrupts – serial communication real – time clock and simple digital LED interface – LCD display interfacing – GLCD display interfacing – TFT display interfacing – keyboard interfacing – touch screen interfacing.

UNIT V   ARM COMMUNICATION INTERFACING AND DEVELOPMENT TOOLS   9

Synchronous and asynchronous data transfer – UART based communication – I^2C Protocol basics – serial communication using I^2C bus: RTC Interfacing, EEPROM data transfer Ethernet communication – I^2S voice bus interface communication. Basic Embedded system Development Tools – Embest embedded IDE for ARM, Study of S3C3V40 based University Teaching Kit – Keil C and Unet ICE JTAG emulator

TOTAL: 45

REFERENCES
1. "ARM Architecture Reference Manual", ARM Ltd, 2011.
2. "The ARM-Thumb Procedure Call Standard", ARM Ltd, 2011.
3. Steve Furber, "ARM System-on-Chip Architecture", 2nd Edition, Addison-Wesley, 2000.
4. Todd D. Morton, "Embedded Microcontrollers", Prentice Hall, 2001.
5. "Embest ARM Teaching System User Manual", Embest Info & Tech, Ltd, Version 2.01.
6. Radu Muresan, "Embedded System Development and Labs for ARM".

CEE3B	PATTERN RECOGNITION	L T P C
	(Common to CSE and CS)	3 0 0 3

OBJECTIVES
- To learn the different approaches for pattern recognition.
- To study various mathematical models in pattern recognition.
- To study the non parametric and clustering techniques.

UNIT I   INTRODUCTION   8
Introduction: Basics of pattern recognition – Design principles of pattern recognition system – Learning and adaptation – Pattern recognition approaches. Mathematical foundations: Linear algebra – Probability theory – Expectation – Mean and Covariance – Normal distribution – Multivariate normal densities – Chi square test of hypothesis.

UNIT II   STATISTICAL PATTERN RECOGNITION   7
Statistical Patten Recognition: Bayesian Decision Theory – Classifiers – Normal density and discriminant functions.

UNIT III   MODELS   10
Parameter estimation methods: Maximum-Likelihood estimation – Bayesian Parameter estimation – Dimension reduction methods – Principal Component Analysis (PCA) – Fisher Linear discriminant analysis – Expectation – maximization (EM) – Hidden Markov Models (HMM) – Gaussian mixture models.

UNIT IV   NON PARAMETRIC TECHNIQUES   10
Nonparametric Techniques: Density Estimation – Parzen Windows – K-Nearest Neighbor Estimation – Nearest Neighbor Rule – Fuzzy classification.

UNIT V   CLUSTERING TECHNIQUES   10
Unsupervised Learning and Clustering: Criterion functions for clustering – Clustering Techniques: Iterative square – Error partitional clustering – K-Means – agglomerative hierarchical clustering – Cluster validation.

                                                                                                                        TOTAL: 45

REFERENCES
1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. Bishop, Christopher M., "Pattern Recognition and Machine Learning", 1st Edition, Springer, 2009.
3. S. Theodoridis, K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.
4. Keinosuke Fukunaga, "Introduction to Statistical Pattern Recognition", 2nd Edition, Academic Press, 2003.
5. Sergios Thedoridis, Konstantinos Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

CEE3C	EVOLUTIONARY COMPUTING	L	T	P	C
	(Common to HVE, CSE, CS and CC)	3	0	0	3

OBJECTIVES
- To brief the basic concepts of evolutionary computation.
- To give idea about various representation, selection and search operations.
- To discuss the basic of fitness evaluation and constraint handling mechanism.
- To outline the concepts of hybrid systems.
- To understand the effect of parameter setting and applications.

UNIT I   INTRODUCTION TO EVOLUTIONARY COMPUTATION   9

Introduction – Possible applications of evolutionary computations – History of evolutionary computation – Genetic algorithms – Evolution strategic – Evolutionary programming – Derivative methods – Stochastic processes – Modes of stochastic convergence – Schema processing – Transform methods – Fitness landscape – Probably Approximately Correct(PAC) learning analysis – Limitation of evolutionary computation methods – Local performance measures.

UNIT II   REPRESENTATION, SELECTION AND SEARCH OPERATORS   9

Representation – Binary strings – Real-valued vectors – Permutations – finite-state   representation – Parse trees – Guidelines for a suitable encoding – Other representations Selection – Proportional selection and sampling algorithms – Tournament selection – Rank based selection – Boltz Mann selection – Other selection methods – Hybrids Generation gap methods – comparison of selection mechanisms – Interactive evolution – Search Operators – Mutation – recombination – Other operators.

UNIT III   FITNESS EVALUATION AND CONSTRAINT HANDLING   9

Fitness Evaluation – Encoding and decoding functions – Competitive fitness evaluation – Complexity based fitness evaluation – Multi objective optimization – Constraint handling techniques – Penalty functions – Decoders – Repair algorithms – Constraint preserving operators – Other constraint handling methods – Constraint satisfaction problems – Population structures – Niching Methods – Specification methods – Island(migration)models.

UNIT IV   HYBRID SYSTEM   9

Self-adaptation – Meta evolutionary approaches – Neural – Evolutionary systems – New areas for evolutionary computation research in evolutionary systems – fuzzy-Evolutionary Systems – Combination with Other Optimization Methods – Combination with local search – Combination with dynamic programming – Simulated annealing and tabu search – Comparison with existing optimization.

UNIT V   PARAMETER SETTING AND APPLICATIONS   9

Heuristics for Parameter setting Issues – Population size – Mutation parameters – Recombination parameters – Implementation of Evolutionary Algorithms – Efficient implementation of algorithms – Computation time of evolutionary operators – Applications – Classical optimization problems – Control Identification – Scheduling – Pattern recognition – Simulation models

TOTAL: 45

REFERENCES
1. Thomas Back, David B. Fogel and Zbigniew Michalewicz, "Handbook on evolutionary computation", Institute of Physics Publishing, 2000.
2. Xin Yao, "Evolutionary Computations: Theory and Applications", World Scientific 39 Publishing, 1999.
3. Goldberg, "Genetic algorithm in search, optimization and machine learning", Addison Wesley, 1998.
4. Davis, "Hand book on Genetic Algorithms", NewYork, 1991.
5. Kenneth A De Jong, "Evolutionary Computation: A Unified Approach", MIT Press, 2006.

CEE3D   **MOBILE COMPUTING**   **L T P C**
                                   (Common to CSE and CS)   **3 0 0 3**

OBJECTIVES
- To know the fundamentals of wireless communication.
- To understand the telecommunication systems.
- To study the different network layers.
- To study various protocols and their uses.

UNIT I   WIRELESS COMMUNICATION FUNDAMENTALS   9
Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas– Signal Propagation – Multiplexing – Modulations – Spread spectrum – Medium Access Control – Space Division Multiple Access – Frequency Division Multiple Access – Time Division Multiple Access – Code Division Multiple Access – Cellular Wireless Networks.

UNIT II   TELECOMMUNICATION SYSTEMS   9
GSM – System Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Handover – Security – General packet radio service.

UNIT III   WIRELESS NETWORKS   9
Wireless LAN – IEEE 802.11 Standards – Architecture – Services – High Performance Radio LAN – Adhoc Network – Blue Tooth.

UNIT IV   NETWORK LAYER   9
Mobile IP – Dynamic Host Configuration Protocol – Routing – Destination Sequential Distance Vector – Dynamic Source Routing – Adhoc On-demand Distance Vector – Zone Routing Protocol – On-Demand Multicast Routing Protocol

UNIT V   TRANSPORT AND APPLICATION LAYERS   9
TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing – Selective Retransmission – Transaction Oriented TCP – Wireless Application Protocol – Wireless Application Protocol Architecture – Wireless Datagram Protocol – Wireless Transport Layer Security – Wireless Transaction Protocol – Wireless Session Protocol – Wireless Markup Language – WML Script – Wireless application environment – Wireless Transaction Application.

TOTAL: 45

REFERENCES
1. Jochen Schiller, "Mobile Communications", 3rd Edition, Pearson Education, 2005.
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3. Asoke k Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile computing", 2nd Edition, Tata McGraw Hill, 2010.
4. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", 1st Edition, Pearson Education, 2003.
5. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", 2nd Edition, Springer, 2003.
6. Burkhardt, "Pervasive Computing", 1st Edition, Pearson Education, 2003.

CEE3E   SECURITY IN WIRELESS SENSOR NETWORKS   L T P C
                   (Common to CSE, CS and CC)   **3 0 0 3**

OBJECTIVES
- To know about the threats and vulnerabilities of communication architecture in WSN.
- To discuss about the various key management and authentication techniques in WSN.
- To study about the operations of existing well known secure routing protocols in WSN.
- To have an idea about the different secured data aggregation mechanisms in WSN.

UNIT I   INTRODUCTION   9
Communication architecture of WSN – Constraints – security requirements – Threats – evaluation – attacks; Vulnerabilities of physical layer – jamming, tampering; Vulnerabilities of data link layer – collisions, exhaustion, unfairness; Vulnerabilities of network layer - Spoofed, Altered, or Replayed Routing Information, Selective Forwarding, Sinkhole, Sybil, Wormholes, Hello Flood Attacks, Acknowledgment Spoofing; Vulnerabilities of transport layer – Flooding, Desynchronization.

**UNIT II   KEY   MANAGEMENT   PROTOCOLS   AND   BROADCAST
               AUTHENTICATION   9**
Key distribution – classifications: deterministic and probabilistic; protocols: LEAP, BROSK, IOS/DMBS, PIKE, SKEW; Broadcast authentication: µTesla, Certificate-Based Authentication Scheme, Basic Merkle Hash Tree Based Authentication Scheme, Enhanced Merkle Hash Tree Based Authentication Scheme, ID-Based Authentication Scheme.

UNIT III   SECURE ROUTING PROTOCOLS   9
 EAR, PRSA, R-LEACH, S-SPIN, Secure-SPIN, Segment transmission secure routing protocol, SONS, SS-LEACH, INSENS

**UNIT IV   DATA   AGGREGATION,   INTRUSION   DETECTION   AND
               AUTOCONFIGURATION   9**
Data Aggregation – plain text based secure data aggregation – SIA, SINP, ESPDA, SSDA, WDA; cipher based secure data aggregation – CDA, HSC, Secure hierarchical data aggregation; Intrusion Detection: IHOP, SEF, DIDS, Decentralized intrusion detection; Auto Configuration – LEADS, PDAA, Dynamic address allocation.

UNIT V   TRUST MANAGEMENT   9
Trust model - Certificate based - Behavior based, Combinational approach; Trust based routing protocols-secure routing based on multiple criteria decision, LEACH -TM, TRANS; Trust based node selection algorithm- cross layer trust model, reliable sensor selection algorithm, novel sensor node selection algorithm.

                                                                TOTAL: 45

REFERENCES
1. Yang Xiao, "Security in distributed, grid, mobile and pervasive computing", Auerbach publications, 3rd Edition, 2006.
2. Yong Wang, Garhan Attebury and Byrav Ramamurthy, "A Survey of security issues in wireless sensor networks" IEEE Communication Surveys & Tutorials, 2nd Quarter 2006.
3. Mohsen Sharifi, Saeid Peurroostaei Ardakani, Saeed Sedighian Kashi, "SKEW: An Efficient Self Key Establishment Protocol for Wireless Sensor Networks", IEEE 2009.
4. Kui Ren, Kai Zeng, Wenjing Lou and Patrick J.Moran, "On Broadcast Authentication in Wireless Sensor Networks", Proc. First International Conference on Wireless Algorithms, Systems, and Applications, WASA 2006, Springer Publication.
5. Hani Alzaid, Ernest Foo and Juan Genzalez Nieto, "Secure Data Aggregation in Wireless Sensor Network: a survey", Australasian Information Security Conference (ACSC2008), Wollongong, Australia, January 2008. Australian Computer Society Inc.

CEE3F   METHODS FOR SELFISH MALICIOUS NODE DETECTION   L T P C
**   3 0 0 3**
OBJECTIVES
- To understand about the legacy security architectures and services
- To know about the various attack taxonomy and their characteristics.
- To have an in depth idea about the trust and reputation systems.
- To understand about the various selfish node detection techniques in adhoc networks.
- To discuss about the simulators like GloMoSim and NS2 with respect to malicious node detections.

UNIT I   INTRODUCTION TO NETWORK SECURITY   9
Security Trends – OSI Security Architecture – Security Services – Security Mechanisms – security Requirements – Model for Network Security – Overview of Symmetric and Public Key Encryption – Authentication and Integrity Mechanism – Key Distribution.

UNIT II   ATTACK TAXONOMY   9
Attack Classification: Passive and Active Attacks – Attackers and their Motivation – Characteristics of Attack Taxonomy – List of Categories – Results Categories – Empirical Lists– Matrices – Process Based Taxonomy – Wormhole – Byzantine – Black hole – DoS – Flooding – Resource Consumption – Location Disclosure – Impersonation Attack Trees – STRIDE.

UNIT III   TRUST AND REPUTATION SYSTEMS   9
Notion of Trust – security and Trust – Collaborative Filtering and Sanctioning – Trust Classes – Trust and Reputation Network Architectures – Reputation Computation Engines – Commercial and Live Reputation System – Trust management in P2P systems – Trust management in Adhoc networks – Issues with Reputation Systems.

UNIT IV   COOPERATION ENFORCEMENT AND DETECTION MECHANISMS   9
Cooperation Enforcement Techniques: Nuglets – Sprite – Detection Mechanisms: Mitigating Routing Misbehavior – OCEAN – CORE – CONFIDENT – PACKET LEASHES.

UNIT V   SIMULATION STUDY   9
GloMoSim: General Architecture of the simulator – Configuring a Network – Mobility Models – Routing Protocols. Network Simulator2: Nodes – Packet Forwarding – Agents Mobile Networking – Trace Monitoring Support – Visualization.
**   TOTAL: 45**

REFERENCES
1. William Stallings, "Cryptography and Network Security Principles and Practices", 4th Edition, Prentice Hall, 2006.
2. B. Wu, J.Chen, and J.Wu, M.Cardei, "A Survey of Attacks and Countermeasures In Mobile Ad Hoc Networks", Wireless Network Security, Springer – Verlag, 2007.
3. Josang, R.Ismail, and C.Boyd, "A Survey of Trust and Reputation Systems for Online Service Provision", Decision Support System, vol. 43, no. 2. pp. 618-644, March 2007.
4. H.Li, and M.Singhal, "Trust management in Distributed Systems", IEEE Computers, vol 40, pp. 45-53, February 2007.
5. http://www.schneier.com/paper-attacktrees-ddj-ft.html
6. http://www.cert.org/research/JHThesis/Chapter6.htmls

CEE3G   CROSS LAYERED WIRELESS ADHOC AND SENSOR NETWORKS   L T P C
3 0 0 3

OBJECTIVES
- To have an idea about the need for layered communication approaches for wireless Adhoc and sensor networks.
- To understand about some examples of cross layered architectures of Adhoc and sensor networks.
- To discuss about the various approaches of cross layers architectures suitable for Adhoc and sensor networks
- To know about the key roles of cross layered architectures in UWB Adhoc Network and Underwater Sensor Networks.

UNIT I   LAYERED COMMUNICATION APPROACHES   9
Introduction to Adhoc and Sensor Networks, Communication Media, Communication Technologies, Optimization Parameters, Channel Separation and Access, Transmission Initiation, Topology, Power, Traffic Load and Scalability, Logical Link Control, Route State Dissemination, Multipath Routing, Power-awareness, Geographical Routing, Quality-of-Service, TCP and UDP, Transport Protocols and Middleware for Adhoc and Sensor Networks, Application Layer.

UNIT II   CROSS-LAYER APPROACHES   9
Cross-Layer Design: Basics, Cross-Layer Design for Traditional Networks, Adhoc and Sensor Networks: An Analogy, Motivating Factors, Design Challenges. Cross-Layer Design Guidelines: Compatibility, Richer Interactions, Flexible and Tunable.

UNIT III   CROSS-LAYER ARCHITECTURES   9
Adhoc Networks: MobileMAN, CrossTalk. Sensor Networks: Sensor Protocol, TinyCubus, Lu.Adhoc and Sensor Networks: Jurdak.

UNIT IV   APPLIED CROSS-LAYER APPROACHES   9
Design Coupling Approaches, Information Sharing Approaches, Global Performance Goals, Maximize Network Lifetime, Energy Efficiency, Maximize Throughput, Minimize Delay, Promote Fairness, Data Accessibility, Efficiency and Generality. Target Networks: Adhoc Networks, Sensor Networks. Input Aspects, Configuration Optimization, Implementation: Unspecified, Centralized, Distributed.

UNIT V   CASE STUDIES   9
Optimization of an RF Sensor Network: Introduction, Adaptive Low Power Listening, Qualitative Analysis, Deployment Results. UWB Adhoc Network: Introduction, UWB Network Principles, UWB Principle, UMAC Protocol, Simulation and Results. Acoustic Underwater Sensor Network: Introduction, Network Battery Life Estimation Method, Topology-Dependent Optimizations, Performance Evaluation.

TOTAL: 45

REFERENCES
1. Raja Jurdak, "Wireless AdHoc and Sensor Networks: A Cross-Layer Design Perspective", Springer Series, New York, 2007.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman, Publishers, 2004.
3. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

CEE3H   MODELING AND SIMULATION OF WIRELESS SYSTEMS   L T P C
                     (Common to CSE and CC)   **3 0 0 3**

OBJECTIVES
- To study about the simulation and verification techniques for generation of random numbers and random variables.
- To understand about the simulation and modeling of communication channels and models.
- To estimate different parameters which are considered for simulation and analyses the performance measures from simulation with some test cases.

UNIT I   SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS   9
Univariate and multi-variate models, Transformation of random variables, Bounds and approximation, Random process models − Markov and ARMA sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

UNIT II   MODELING OF COMMUNICATION SYSTEMS   9
Information Sources, Formatting/Source Coding, Digital Waveforms, Line Coding, Channel Coding, Radio frequency and Optical Modulation, Demodulation and Detection, Filtering, Multiplexing/Multiple Access, Synchronization, Calibration of Simulations.

UNIT III   COMMUNICATION CHANNELS AND MODELS   9
Fading and Multipath Channels, Almost Free-Space Channels, Finite State Channel Models, Methodology for Simulating Communication Systems Operating over Fading Channels, Reference Models for Mobile Channels: GSM, UMTS-IMT-2000.

UNIT IV   ESTIMATION OF PARAMETERS IN SIMULATION   9
Quality of an estimator, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Estimating the Power Spectral Density of a process, Estimating the Delay and Phase.

UNIT V   ESTIMATION OF PERFORMANCE MEASURES FROM SIMULATION   9
Estimation of SNR, Performance Measures for Digital Systems, Importance sampling method, Efficient Simulation using Importance Sampling, Quasianalytical Estimation. Case Studies: 16-QAM Equalized Line of Sight Digital Radio Link, CDMA Cellular Radio System.

TOTAL: 45

REFERENCES
1. M.C. Jeruchim, Philip Balaban and K.Sam Shanmugam, "Simulation of Communication Systems Modeling, Methodology and Techniques", 3rd Edition, Kluwer Academic/Plenum Publishers, New York, 2000.
2. C. Britton Rorabaugh, "Simulating Wireless Communication Systems: Practical Models In C++", 2nd Edition, Prentice Hall, 2004.
3. William H. Tranter, K. Sam Shanmugan, Theodore S. Rappaport, Kurt L. Kosbar, "Principles of Communication Systems Simulation with Wireless Applications", 3rd Edition, Prentice Hall PTR, 2002.
4. John G. Proakis, Masoud Salehi, Gerhard Bauch, Bill Stenquist, Tom Ziolkowski, "Contemporary Communication Systems Using MATLAB" Thomson-Engineering, 2nd Edition, 2002.

CEE3J   **XML AND WEB SERVICES**   **L T P C**
                        (Common to CSE and CC)   **3 0 0 3**

OBJECTIVES
- To understand the need of XML in web based systems.
- To learn the architecture of web services.
- To gain knowledge in protocols used in web services.

UNIT I   INTRODUCTION   9
Role of XML – XML and the Web – XML Language Basics – Comparison with HTML – XML Documents – Well-Formed XML Document – XML Elements – Types of Elements – Attributes – Elements Vs Attributes – C DATA Sections.

UNIT II   XML TECHNOLOGY   9
XML – XML Schemas – Validating XML documents using XML Schema – Namespaces – Structuring with Schemas – Presentation Techniques – Transformation Techniques.

UNIT III   WEB SERVICES   9
Overview – Architecture – Key Technologies – UDDI Data Structure – Business Entity – Business Service – WSDL – Types, Messages, Ports, Bindings, Services.

UNIT IV   SOAP   9
Overview of SOAP – HTTP – XML – RPC – Message Structure – Intermediaries – Actors – Design Patterns and Faults – SOAP with Attachments – SOAP and Web Services in E- Commerce.

UNIT V   XML SECURITY   9
Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines for Signing XML Documents – XML in Practice

TOTAL: 45

REFERENCES
1. Michael Papazoglou, "Web Services: Principles and Technology", 1st Edition, Prentice Hall of India, 2008.
2. Frank. P. Coyle, "XML, Web Services and the Data Revolution", 1st Edition, Pearson Education, 2002.
3. Ron Schmalzer, Travis Vandersypen, Jason Bloomberg, "XML and Web Services Unleashed", 2nd Edition, Pearson Education, 2008.
4. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, "Developing Java Web Services", 2nd Edition, Wiley Technology Publishing, 2004.
5. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", 1st Edition, Prentice Hall Professional, 2004
6. James McGovern, Sameer Tyagi, Michael Stevens and Sunil Mathew, "Java Web Services Architecture", 2nd Edition, Morgan Kaufmann Publishers, 2005.

CEE3K   **DATA WAREHOUSING AND DATA MINING**   **L T P C**
                                                                        3 0 0 3

OBJECTIVES
- To study the functionalities of data warehousing and data mining.
- To learn the preprocessing and association rule concepts.
- To know the various classification and clustering methods.
- To understand the different types of mining.

UNIT I   INTRODUCTION   9
Fundamentals of data mining – Data Mining Functionalities – Classification – Major issues in Data Mining – Data Warehouse and OLAP Technology for Data Mining and Data Warehouse. Multidimensional Data Model, Architecture, Implementation.

UNIT II   DATA PREPROCESSING AND ASSOCIATION RULE MINING   9
Need of preprocessing the data – Data cleaning – Data integration and transformation – Data reduction – Data discretization and Concept hierarchy generation. 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   9
Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Rule based classification – Classification by back propagation – Support Vector Machines – 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   9
Types of data in cluster analysis – Categories – 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   MINING COMPLEX OBJECTS   9
Multidimensional analysis – Descriptive mining of complex data objects – Spatial data mining – Multimedia data mining – Text mining – Mining the World Wide Web.
                                                                        TOTAL: 45

REFERENCES
1. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2011.
2. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", 10th Reprint, Tata McGraw Hill, 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data mining Theory and Practice", 2nd Edition, Prentice Hall of India, 2006.
4. G. K. Gupta, "Introduction to Data Mining with Case Studies", 2nd Edition, Prentice Hall of India, 2011.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", 2nd Edition, Pearson Education, 2007.

CEE3L   **SOFTWARE QUALITY ASSURANCE**   **L T P C**
                                                                     3 0 0 3

OBJECTIVES
- To learn the basic concepts in Software Quality Assurance.
- To study the basics of software testing for assuring software quality.
- To understand the metrics of software quality and quality management standards.

UNIT I   INTRODUCTION   9
Introduction to software quality – Challenges – Objectives – Quality factors – Components of SQA – SQA Plan – Steps to develop and implement SQA Plan – Contract review – Development – SQA components in project life cycle – SQA defect removal policies – Reviews.

UNIT II   SOFTWARE TESTING   9
Basics of software testing – Test generation from requirements – Finite state models – Combinatorial designs – Test selection, minimization and prioritization for regression testing – Test adequacy, assessment and enhancement.

UNIT III   SOFTWARE TESTING TYPES   9
Testing strategies – Structured approach to testing – Test factors – White box and Black box approach – Functional and structural testing – Workbench concept – Testing methodologies – Testing tactics checklist – Integration testing – System and acceptance testing – Performance testing – Regression testing – Internationalization testing – Adhoc testing – Website testing – Usability testing – Accessibility testing – Test plan – Management – Execution and reporting – Software test automation – Automated testing tools.

UNIT IV   IMPLEMENTATION AND VALIDATION OF SOFTWARE QUALITY
                  METRICS   9
Hierarchical models of software quality – software quality metrics – Product quality metrics – In-process quality Metrics – Metrics for software maintenance – Establish quality requirements – Identify Software quality metrics – Implement the software quality metrics – Validate the software quality metrics– Software product quality – Software maintenance quality – Effect of case tools – Software quality infrastructure – Procedures – Certifications – Configuration management – Documentation control.

UNIT V   QUALITY MANAGEMENT STANDARDS   9
Project progress control – Costs – Quality management standards – Project process standards – Management and its role in SQA – SQA unit.

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REFERENCES
1. Daniel Galin, "Software Quality Assurance – From Theory to Implementation", 3rd Edition, Pearson Education, 2009.
2. Aditya Mathur, "Foundations of software testing", 2nd Edition, Pearson Education, 2008.
3. Srinivasan Desikan and Gopalaswamy Ramesh, "Software testing – principles and practices", 2nd Edition, Pearson Education, 2007.
4. William E. Perry, "Effective Methods for Software Testing", 2nd Edition, Wiley Publishers, 2006.
5. Mordechai BenMenachem, Garry S. Marliss, "Software Quality", 1st Edition, Thomson Learning publication, 2004.

CEE3M   **ONTOLOGY AND SEMANTIC WEB**   **L T P C**
                                                                        3 0 0 3

OBJECTIVES
- To study the essentials of ontology.
- To learn the tools used for the construction of ontology.
- To learn the applications of semantic web.

UNIT I   WEB INTELLIGENCE   9
Introduction – The Semantic Web Vision – Today's Web– From Today's Web to the Semantic Web
– Layered Approach to Semantic Web Technologies – Overview of Structured Web Documents in
XML – XML Language Overview – Structuring – Namespaces – Addressing and Querying XML
Documents – Processing of documents.

UNIT II   ONTOLOGY LANGUAGES   9
Ontologies and their role in the Semantic Web – Ontology Languages for the Semantic Web –
Resource Description Framework (RDF) – RDF Schema – Ontology Web Language (OWL) –
UML – XML – XML Schema.

UNIT   III   ONTOLOGY CONSTRUCTION   9
Ontology Engineering – Constructing Ontology – Ontology Methods – Ontology Sharing and
Merging – Ontology Libraries and Ontology Mapping – Logic, Rule and Inference Engines.

UNIT   IV   ONTOLOGY DEVELOPMENT TOOLS   9
Ontology Development using Protege Editor – Ontology Querying – Ontology Reasoning and
Description Logic (DL) – Semantic Web Application Areas – Ontology Programming with Jena
API.

UNIT V   SEMANTIC WEB APPLICATIONS   9
Demonstrating power of Semantic Technology for Search – Personalization, Contextual Directory and
custom/enterprise applications – Next generation Semantic Content Management – Contributions of
Information Retrieval, Artificial Intelligence, Logic, Natural Language Processing, Database and
Information system to Semantic Web – Ontology Integration versus Interoperation.

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REFERENCES
1. Berners Lee, Gödel and Turing "Thinking on the Web", 2nd Edition, Wiley Inter science, 2008.
2. Peter Mika, "Social Networks and the Semantic Web", 1st Edition, Springer Publications, 2007.
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CEE3N   **INFORMATION RETRIEVAL TECHNIQUES**   **L T P C**
                                                                                                                                    3 0 0 3

OBJECTIVES
- To learn the various information retrieval models.
- To know about pattern matching algorithms and multimedia Information Retrieval.
- To study the query languages, data models and applications.
- To learn the big data analytics and create statistical models.

UNIT I   INTRODUCTION   9
Basic concepts – Retrieval process – Modeling – Classic information retrieval – Set theoretic, Algebraic and Probabilistic models – Structured text retrieval models – Retrieval evaluation –Word sense disambiguation.

UNIT II   QUERYING   9
Languages – Key word based querying – Pattern matching – Structural queries – Query operations – User relevance feedback – Local and global analysis – Text and multimedia languages.

UNIT III   TEXT OPERATIONS AND USER INTERFACE   9
Document preprocessing – Clustering – Text compression – Indexing and searching – Inverted files – Boolean queries – Sequential searching – Pattern matching – User interface and Visualization – Human Computer Interaction – Access process – Starting points – Query specification – context – User relevance judgment – Interface for search.

UNIT IV   MULTIMEDIA INFORMATION RETRIEVAL   9
Data models – Query languages – Spatial access models – Generic approach – One dimensional time series – Two dimensional color images – Feature extraction.

UNIT V   BIG DATA ANALYTICS AND APPLICATIONS OF IR   9
Introduction to Big Data Analytics – Big Data Applications – Challenges in Unstructured data processing – Tools – Applications: Search engines – Digital libraries – Online public access catalogs.

TOTAL: 45

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CEE3P   PERFORMANCE EVALUATION OF COMPUTER SYSTEMS   L T P C
**   AND NETWORKS   3 0 0 3**

OBJECTIVES
- To study the concept of workload and queuing models.
- To know the asymptotic bounds and its performance.
- To study the performance evaluation of computer systems and networks.

UNIT I   INTRODUCTION   9
Introduction to performance evaluation – Metrics – Workload – Problem of workload characterization – Representativeness of a workload model – Test workloads – Workload model implementation techniques – Measurement – Hardware – Software monitors.

UNIT II   QUEUING NETWORK MODELING   9
Overview – Modeling cycle – Understanding the objectives of a study – Workload characterization – Sensitivity analysis – Sources of insight – Fundamental laws – Queueing network model inputs and outputs.

UNIT III   BOUNDS ON PERFORMANCE   9
Asymptotic bounds – Using asymptotic bounds – Balanced system bounds – Models with one job class – Workload representation – Solution techniques.

UNIT IV   MEMORY   9
System with known average multiprogramming level – Memory constraints – Swapping – Paging – Disk I/O – Channel in NON – RPS I/O subsystems – Channel contention in RPS I/O subsystems – Additional path elements – Multipathing – Other architectural characteristics – Processors.

UNIT V   PARAMETERIZATION   9
Existing systems – Evolving systems – Proposed systems – Simulation – Analysis of simulation results – Simulation of General and extended queueing networks – Response time distributions – Local area networks – models – Link performance – Transaction response, Link throughput, Multiplexed link Capacity – Ethernet, token ring performance analysis.

**   TOTAL: 45**

REFERENCES
1. Edward D.Lazawska, John zahorjan, G.Scott Graham and Kenneth C.Sevcik, "Quantitative system performance - Computer system analysis with queueing network models", 1st Edition, Prentice Hall Inc, 1984.
2. Domenico Ferrari, Giuseppe Serazzi and Alexandro Zeijher, "Measurement and Tuning of Computer Systems", 2nd Edition, Prentice Hall Inc, 2003.
3. Michael F.Mories and Paul F.Roth,. "Tools and techniques, Computer Performance Evaluation", 2nd Edition, Springer, 2001.
4. John Freer R., "Computer Communications and networks", 2nd Edition, East-West press Pvt, Ltd., 2004.

CEE3Q   **AGENT BASED INTELLIGENT SYSTEMS**   **L T P C**
                                                                                   3 0 0 3

OBJECTIVES
- To study about knowledge based systems and problem solving methods.
- To learn the probabilistic reasoning techniques for intelligent systems.
- To develop intelligent systems for concrete computational problems.
- To learn different learning agents.

UNIT I   INTRODUCTION   6
Basic definition - History – Intelligent agents – Agents and environments – Structure of agents.

UNIT II   PROBLEM SOLVING AGENTS   9
Searching for solutions – Uninformed search strategies – Informed search strategies – online search agents and unknown environments – Constraint satisfaction problems.

UNIT III   KNOWLEDGE BASED AGENTS   10
Knowledge representation – logic – proposition – First order logic – Inference in first order logic – Algorithms – Knowledge representation Issues – Knowledge representation language

UNIT IV   PLANNING AND PROBABLISTIC AGENTS   10
Planning problem – partial order planning – Conditional planning – multi agent planning – uncertainty and probabilistic reasoning.

UNIT V   LEARNING AGENTS   10
Learning from observations – Learning decision trees – Statistical learning methods – Instance based learning – Neural network techniques for learning – Communicative agents – Probabilistic agents – Perception and robotics – AI future.

                                                                          TOTAL: 45

REFERENCES
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5. Zili Zhang, "Agent-Based Hybrid Intelligent Systems: An Agent-Based Framework for Complex Problem Solving", 1st Edition, Springer, 2004.
6. David Poole, Alan Mackworth, "Artificial Intelligence foundations of computational agents", 1st Edition, Cambridge University Press, 2010.

CEE3R   **VISUALIZATION TECHNIQUES**   **L T P C**
                                                                            3 0 0 3

OBJECTIVES
- To learn the issues and foundations for visualization.
- To know the multidimensional visualization.
- To perform case studies using various analysis methods
- To learn about new visualization techniques and applications

UNIT I   VISUALIZATION   9
Introduction – Visualization tools and techniques – Issues – Data representation – Data presentation – Interaction.

UNIT II   FOUNDATIONS FOR DATA VISUALIZATION   9
Visualization stages – Experimental semiotics based on perception Gibson's affordance theory– Model of perceptual processing – Types of data.

UNIT III   VISUALIZATION METHODS   9
Computer Visualization: Exploring Complex Information Spaces – Fisheye views –   Applications – Comprehensible fisheye views – Fisheye views for 3D data – Non linear magnification – Comparing visualization of information spaces – Abstraction in computer graphics – Abstraction in user interfaces – Non-Computer Visualization.

UNIT IV   MULTIDIMENSIONAL VISUALIZATION   9
One Dimension – Two Dimension – Three Dimension – Multiple Dimension – Trees – Web Works – Data Mapping: Document Visualization – Workspaces.

UNIT V   APPLICATIONS AND ANALYSIS   9
Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis.

TOTAL: 45

REFERENCES
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CEE3S   **COMPONENT BASED TECHNOLOGY**   **L T P C**
                                                                                3 0 0 3

OBJECTIVES
- To study the introductory concepts of components.
- To know about beans, Remote method invocation techniques.
- To learn the CORBA, COM and .NET Technologies.
- To study about frame works and its development.

UNIT I   INTRODUCTION   9
Software Components – Objects – Fundamental properties of component technology – Modules – Interfaces – Callbacks – Directory services – Component architecture – Components and middleware.

UNIT II   JAVA COMPONENT TECHNOLOGIES   9
Threads – Java Beans – Events and connections – Properties – Introspection – JAR files – Reflection – Object serialization – Enterprise Java Beans – Distributed object models – IDL interface – Proxy – Marshalling – RMI – IIOP.

UNIT III   CORBA TECHNOLOGIES   9
Java and CORBA – Benefits of java programming with CORBA – CORBA overview – Interface definition language – Object request broker – System object model – Portable object adapter – CORBA services – CORBA component model – Containers – Application server – Model driven architecture.

UNIT IV   COM AND .NET TECHNOLOGIES   9
COM – Distributed COM – COM facilities and services – Applying COM objects – Query interface – Reference counting – Dynamic linking – OLE containers and servers – ActiveX controls – .NET components – Assemblies – Appdomains – Contexts – Reflection – Remoting.

UNIT V   COMPONENT FRAMEWORKS AND DEVELOPMENT   9
Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – Directory objects – Component oriented programming – Component design and implementation tools – Testing tools – Assembly tools

                                                                        TOTAL: 45
REFERENCES
1. Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", 2nd Edition, Pearson Education Publishers, 2003.
2. Ed Roman, "Enterprise Java Beans", 3rd Edition, Wiley Publishers, 2004.
3. Andreas Vogel and Keith Duddy, "Java Programming with CORBA", 2nd Edition, John Wiley & Sons, 1998.
4. Dale Rogerson, "Inside COM", 3rd Edition, Pearson Education, 2000.
5. Alan w. Brown, "Large scale component based development", 1st Edition, Prentice Hall, 2000.

CEE3T   **GAME THEORY**   **L T P C**
                                                                                                       3 0 0 3

OBJECTIVES
- To provide a conceptual overview to the tools of game theory and some of its applications.
- To know the concepts of game theory in wireless network applications.
- To analyze situations in which two or more individuals/firms/political parties interactions in a strategic manner.
- To help better understanding situations involving conflicts and/or cooperation.

UNIT I   INTRODUCTION   8
Introduction – Rules of the game – Strategic games – Introduction to zero sum games – Nash Equilibrium – Bayesian game – Mixed Strategic Nash Equilibrium.

UNIT II   EXTENSIVE GAME WITH PERFECT INFORMATION   10
Extensive game with perfect information – Bargaining games – repeated games – subgame perfect equilibrium.

UNIT III   EXTENSIVE GAME WITH IMPERFECT INFORMATION   10
Extensive game with Imperfect Information – Equivalence of Extensive games – mixed strategy – strategy as machine.

UNIT IV   COALITION GAME THEORY   9
Coalition Game with transferable payoff – Exchange economy – Stable Set Bargaining – Shapley Value.

UNIT V   EVOLUTIONARY GAME THEORY   8
Evolutionary theory – stability – Dynamic structure – Stochastic stability.

TOTAL: 45

REFERENCES
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CEE3V   NETWORK CONGESTION CONTROL AVOIDANCE TECHNIQUE   L T P C
3 0 0 3

OBJECTIVES
- To have an in depth idea about the need for effective congestion control and avoidance mechanisms with respect to network layer.
- To understand about the various congestion control techniques which are used in TCP and Frame Relay Networks.
- To get a deep concept about the congestion avoidance in TCP Flow Control and various congestion avoidance mechanisms.

UNIT I   CONGESTION CONTROL IN TCP   9
Internet Congestion Collapse - Resource Management Solution – Van Jacobson Congestion Control – Elements of Congestion Control – TCP Variants – Karns algorithm – Issues in TCP - TCP Congestion Control Concepts.

UNIT II   CONGESTION CONTROL IN NETWORK LAYER   9
Network Congestion – Routing algorithm – Packet queuing and service policy – Congestion Control Methods – Choke Packets – Multiprotocol routers – QoS – Concatenated virtual circuits – Tunneling – Packet Fragmentation.

UNIT III   CONGESTION CONTROL IN FRAME RELAY   9
Frame Relay Congestion Technique – Discard control – FECN – BECN – Frame Relay Traffic Shaping – Implicit Congestion Control – QoS in Frame relay – Frame Relay Virtual Circuits – FRAD techniques.

UNIT IV   CONGESTION AVOIDANCE FLOW CONTROL   9
End to end flow control in TCP – Slow Start – Fast retransmit, Fast Recovery – Additive Increase / Multiplicative Decrease.

UNIT V   CONGESTION AVOIDANCE MECHANISM   9
RED – REM – PI – Hop by Hop techniques – New Congestion Avoidance in TCP – ECN – Round Trip Time variance estimation – Dynamic window sizing on congestion – Combined Slow start and Congestion Avoidance algorithm.

TOTAL: 45

REFERENCES
1. Michael Welzl, **"**Network Congestion Control", John Wiley & Sons, May 2006.
2. Pete Loshin, "TCP/IP Clearly explained", 4th Edition, Morgan Kauffmann Series in Networking, 2003.
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4. R. Srikant, "The Mathematics of Internet Congestion Control", Springer Publications, 2004.
5. Michael Welzl, "Scalable Performance Signalling and Congestion Avoidance", Kluwer Academic Publishers, 2003.

CEE3W   TRUSTED SERVICES AND PUBLIC KEY INFRASTRUCTURE   L T P C
                                                                        3 0 0 3

OBJECTIVES
- To understand about the need of public key infrastructure technologies, its algorithms, its design, implementation and management issues.
- To study about the trusted services relevant to e-commerce.
- To discuss about the applications of public key infrastructure in e-commerce and e-governance.

UNIT I   OVERVIEW OF PKI TECHNOLOGY   10
Overview of PKI Technology: Symmetric vs. Asymmetric Ciphers – PKI Services – PKI Enabled Services – Certificates and Certification – Digital Signatures – Securing Web Transactions – Key and Certificate Life Cycles – PKI Standards – Third Party CA Systems – Secure Socket Layer(SSL) – CA System Attacks – Key Escrow vs. Key Recovery, Certification Practices – Securing Business Applications – PKI Readiness.

UNIT II   PKI ALGORITHMS   8
Public Key Algorithms – Knapsack, RSA, Pohlig–Hellman, Rabin, Elgamal, McElliece – Elliptic Curve Cryptosystems – LUC – Finite Automation Public Key Cryptosystems – Public Key Digital Signature Cryptosystems – GOST, ESIGN.

UNIT III   DESIGN, IMPLEMENTATION AND MANAGEMENT   10
Design, Implementation and Management of PKI: PKI Design Issues, PKI – ROI – Architecture for PKI (APKI) – Implementing Secure Web services Requirements using PKI – Versign's Foundation in Managed Security Services – Implementation and Deployment – Implementation Costs – PKI Performance – Obtaining a Certificate – Certification Revocation with Managed PKI – Open Revocation Solutions for Today's Enterprise PKI needs.

UNIT IV   E-COMMERCE SECURITY THREATS   9
Security Threats to E-commerce: Internet Security Issues Overview – Intellectual Property Threats, Threats to the Security – Client Computers – Communication Channels – Server Computers – Implementing Electronics Commerce Security: Objects, Protecting – Client Computers – Communication Channels – Web Server – Access Control: Authentication – Authorization and Accountability Controls.

UNIT V   APPLICATIONS OF PKI   8
Applications of PKI: Trust Models – Deployment and Operation, X.509 Certificates – E-commerce: building blocks – Trusted Business Environment for E-commerce – Certification – Certification Practice and Policy, Registration – Certification usage and revocation – PKI in Electronic Government – Trusted Services and PKI: Technology Commonality in Approaches and Government Initiatives.

TOTAL: 45

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1. Larry Caffrey, Rogers W'o Okot-Uma, "Trusted Services and Public Key Infrastructure", 1st Edition, Common Wealth Secretariat Publishers, 2001.
2. Cartisle Adams, Steve Lloyd, "Understanding PKI: Concepts, Standards and Deployment Considerations", 2nd Edition, Pearson Education, 2003.
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CEE3X   **WIRELESS MAN**   **L T P C**
                                                                               3 0 0 3

OBJECTIVES
- To know about what is WiMAX and its need in the current scenarios
- To study the various WiMAX standards, WiMAX broadband systems and applications.
- To get an overview of WiMAX Radio and its Channelization concepts.
- To discuss about the operations of WiMAX and its QoS.

UNIT I   INTRODUCTION TO WIMAX   9
Advantages of WiMAX – WiMAX compared to 802.11 Wi-Fi, WiMAX Comparted to Mobile, Telephone Data Systems, Data Transmission Rates, WiMAX Service Rates, Radio Coverage Area, Frequency Bands, channel Loading, Spectral Efficiency, Fixed WiMAX, Mobile WiMAX.

UNIT II   WIMAX STANDARDS, BROADBAND APPLICATIONS   9
WiMAX Standards, WiMAX VoIP, Broadband Data Connections, Digital Television, E1/T1 over WiMAX, Urban WiMAX Hot Zones, Surveillance Services, Multi-tenant Units (MTU) and Multi-Dwelling Unit (MDU) connections, Rural Connections.

UNIT III   WIRELESS BROADBAND SYSTEM PARTS, TECHNOLOGIES   10
Chassis Based Systems, Pico Based Systems, Subscriber Stations (SS), Indoor Subscriber Stations, Outdoor Subscriber Stations, Base Stations (BS), Indoor Base Stations, Outdoor Base Stations, Packet Switches, Operational Support System (OSS), Gateways. Antennas Orthogonal Frequency Division Multiplexing (OFDM), Orthogonal Frequency Multiple Access (OFDMA), Frequency Reuse, Adaptive Modulation, Diversity, Transmission, Transmission Diversity, Receive Diversity, Frequency Diversity, Temporal (Time) Diversity, Spatial Diversity, Adaptive Antenna System (AAS).

UNIT IV   OVERVIEW TO WIMAX RADIO   8
WiMAX Protocol Layers, MAC Convergence, MAC Layer, MAC Privacy, Physical Layer, Security Sub Layer, Addressing, Medium Access Control Protocol Data Units (MACPDUs), Radio Packets (Bursts), Channel Descriptors, Channel Coding, Duplex Transmission, Ranging, Dynamic Time Alignment (DTA), Dynamic Frequency Selecton (DFS), RF Power Control, Channel Measurement Reports, Payload Header Suppression (PHS), Convergence Sublayer (CS), Sub Channelization (Sub64 carriers), Retransmission Policy, Selective Repeat (SR), Hybrid Automatic Repeat Request (HARQ), Physical RF Channels, Logical Channels Connections ID (CID), Service Flow ID (SFID).

UNIT V   WIMAX OPERATION AND QoS   9
WiMAX Operation, Channel Acquisition, Initial Ranging, Medium Access Control, Radio Link Control (RLC), Quality of Service (QoS), Service Availability, Data Throughput, Delay, Jitter, Error Rate, Bit Error Rate (BER), Packet Loss Rate (PLR), Scheduling Services, Unsolicited Grant Service (UGS), Real Time Polling Service (RTPS), Non-Real Time Polling Service (NRTPS), Best Effort Service (BES), Service Flows and Classes.

                                                                             TOTAL: 45

REFERENCES
1. Lawrence Harte, Dr. Kalai Kalaichelvan "WiMAX Explained", 1st Edition, Althos Publishers, 2007.
2. Jeffrey G.Andrews, Arunabha Ghosh, Rais Muhamed, "Fundamentals of WiMAX : Understanding Broadband Wireless Networking", 1st Edition, Prentice Hall, 2007.
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CEE3Y   **ADVANCED SECURITY MECHANISM**   **L T P C**
3 0 0 3

OBJECTIVES
- To know about the language based formal approaches to security mechanisms
- To understand about the kernel level architectures which supports to design advanced security mechanisms.
- To get an in depth idea about the proof carrying code for development of secured and safety programs.
- To understand in detail about the java virtual machine as a case study of security internals.

UNIT I   MATHEMATICAL APPROACHES TO SECURITY   9
Basics – Language based Approach to security, Aliasing Problem, Encapsulation in Object Oriented Programming Language, Ownership Types and Permission Based Protection – Object Relationship Based on Subsumption, Issues on Software Protection, Mathematical Approach To Prove Safety.

UNIT II   KERNEL INTERNALS TO SECURITY   9
Kernel Embedded Handlers – Software Based Fault Isolation, Address Based Mechanism for safety, Inline Reference Monitor, SASI (Security Automata SFI Implementation). Trusted Compiler, Kernel Embedded Interpreter, Code Inspection.

UNIT III   PROOF CARRYING CODE   9
Typed Assembly Language (TAL) – core and Implementation, Type Invariant, Proof Carrying Code (PCC) – Defining Safety Policy, Certifying the Safety Programs, Validating the Safety Proofs, Approach Towards Efficiency, Foundational Proof Carrying Code (FPCC) mechanism.

UNIT IV   JVM INTERNALS   9
JVM Internals – Java stack Inspection and General theory, Garbage Collection, Beyond Type Safety, Sandboxing Mechanism in Java, Lifetime of Types, JVM Memory Management, JVM Working and Operating System Interaction.

UNIT V   PROGRAMMING LANGUAGES FOR SECURITY KERNALS   9
Case Study – language based Extensible Operating System – J-Kernel and SPIN, Cyclone Programming Language, Ownership Types, Island Types, Balloon Types, External Uniqueness Class-Based Programming Language and Prototype-Based Programming Language.

TOTAL: 45

REFERENCES
1. Gary McGraw and EdFalten, "Securing Java", 2nd Edition, John Wiley Publishers, 2005.
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CEE3Z   SECURITY ON DISTRIBUTED SYSTEMS   L T P C
                                                                         3 0 0 3

OBJECTIVES
- To understand the concepts, advantages and Limitations of Security in Distributed Computing.
- To understand the concepts, advantages and Limitations of Security in Pervasive Computing.
- To recognize the basic concepts of Quantum theory and helps to solve security issues.

UNIT I SECURITY IN DISTRIBUTED COMPUTING   9
Cover free families - m Cover Free Families – Properties - Applications – q-Resilient IBE - Short Signature - ID based Hierarchical Key graph Scheme - Multi privileged group communication – Access control policy - Basic concepts of access control - Discretionary access control and mandatory access control - Lattice-based Models - Covert Channels - Role based Access Control - Negotiation solution.

UNIT II   SECURITY IN PERVASIVE COMPUTING   9
Security issues in RFID systems - Introduction - RFID Security and privacy - RFID chips -Techniques and Protocols - RFID anti-counterfeiting, Man-in-the-middle attacks on RFID systems -Digital Signature Transponder - Combining Physics and Cryptography to Enhance Privacy in RFID Systems - Scalability Issues in Large - Scale Applications - An Efficient and Secure RFID Security Method with Ownership Transfer – Policy - based Dynamic Privacy Protection Framework leveraging Globally Mobile RFIDs - User-Centric Security for RFID based Distributed Systems - Optimizing RFID protocols for Low Information Leakage, RFID: an anti-counterfeiting tool -Performance of 802.15.4 cluster-key Exchange Protocol – Wireless network interface cards.

UNIT III   QUANTUM COMPUTATION   9
Mathematical preliminaries - Basic concepts from quantum theory - Postulates of QM-Wave -Particle duality - Uncertainty principle – Dynamics – Superposition - No-cloning theorem -Entanglement and EPR paradox.

UNIT IV   QUANTUM INFORMATION   9
Qubits and secure key Distribution - Quantum gates - Quantum circuits - Quantum gate arrays - Quantum parallelism Applications: Superdense coding and quantum teleportation Universal quantum gates.

UNIT V   QUANTUM ALGORITHMS   9
Deutsch – Jozsa – Simon - Shor-Grover & heuristic search - Quantum error correction.

TOTAL: 45 PERIODS

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