## REGULATIONS - 2013
### Curriculum and Syllabi of Full Time
#### M.E. (COMPUTER SCIENCE AND ENGINEERING)

### SEMESTER I

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**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)

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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE – 69**
LIST OF ELECTIVES FOR M.E.COMPUTER SCIENCE AND ENGINEERING

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CEC11 DISCRETE STRUCTURES AND FORMAL LANGUAGES

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


UNIT II SET THEORY


UNIT III FORMAL LANGUAGES


UNIT IV FINITE STATE AUTOMATA


UNIT V GRAPH THEORY

Graphs – Graph terminology and special types of graphs – Graph isomorphism – Connectivity – Euler and Hamiltonian graphs.

L: 45 T: 15 TOTAL: 60

REFERENCES

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
2. E. Horowitz, S. Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, Galgotia,
   Reprint 2009.
   2007.
   Reprint 2010.
CEC13 ADVANCED COMPUTER ARCHITECTURE (Common to CSE, CC)  L T P C  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

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

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
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

UNIT II SNMP 9

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

UNIT V NETWORK MANAGEMENT TOOLS AND SYSTEMS 9

TOTAL: 45

REFERENCES
CEC15  OBJECT ORIENTED SOFTWARE ENGINEERING  

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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  

UNIT II  ANALYSIS  

UNIT III  SYSTEM DESIGN  
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  

UNIT V  CHANGE MANAGEMENT  

TOTAL: 45

REFERENCES

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.
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

UNIT II OBJECT RELATIONAL DATABASES 10

UNIT III SPATIAL AND TEMPORAL DATABASES 8

UNIT IV MOBILE DATABASES 8

UNIT V MULTIMEDIA DATABASES 9

TOTAL: 45

REFERENCES
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

UNIT II  STORAGE MANAGEMENT                                  10

UNIT III  FILE SYSTEMS                           8

UNIT IV  DISTRIBUTED OPERATING SYSTEMS                                                10

UNIT V  THREADS AND DISTRIBUTED FILE SYSTEMS                                   7

TOTAL: 45

REFERENCES
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

UNIT II  LEXICAL ANALYSIS  10

UNIT III  SYNTAX DIRECTED TRANSLATION  9

UNIT IV  CODE GENERATION  9

UNIT V  CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS  9

TOTAL: 45

REFERENCES
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

UNIT II  DYNAMIC HTML  9

UNIT III  SCRIPTS AND APPLETS  9

UNIT IV  SERVLETS  9

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

TOTAL: 45

REFERENCES
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.

Required Software: Java, XML, HTML and Scripting languages

TOTAL: 45
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

UNIT II SEARCH ENGINES AND DATA VISUALIZATION 9

UNIT III STATISTICS AND DATA MINING 9

UNIT IV PATTERN MATCHING 9

UNIT V MODELING AND SIMULATION 9

TOTAL: 45

REFERENCES
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

UNIT II  GRID COMPUTING TECHNOLOGIES  9

UNIT III  FUNDAMENTALS OF CLOUD COMPUTING  9

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

TOTAL: 45

REFERENCES
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

UNIT IV  NETWORK SECURITY, FIREWALLS AND WEB SECURITY  9
Introduction on Firewalls – Types of Firewalls – Firewall Configuration and Limitation of Firewall –
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
2008.
Learning, 2009.
6. Fahim Hussain Yusuf Bhaiji, “Network Security Technologies and Solutions (CCIE Professional
CEE2D  ADHOC NETWORKS  (Common to CSE, CS and CC)  L T P C  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

UNIT II  ADHOC NETWORK ROUTING AND TCP  9

UNIT III  WSN - MAC  9

UNIT IV  WSN ROUTING, LOCALIZATION AND QoS  9

UNIT V  MESH NETWORKS  9

TOTAL: 45

REFERENCES
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 orthonormal 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.

UNIT V  APPLICATIONS  9

TOTAL: 45 PERIODS

REFERENCES
CEE2F SOFT COMPUTING
(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

UNIT II FUZZY SYSTEMS 9

UNIT III ARTIFICIAL NEURAL NETWORKS 9

UNIT IV NEURO- FUZZY MODELING 9

UNIT V GENETIC ALGORITHMS 9

TOTAL: 45

REFERENCES
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

UNIT II  DISTRIBUTED OPERATING SYSTEMS  12

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

UNIT V  DISTRIBUTED OBJECT BASED SYSTEM  8

TOTAL: 45

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

UNIT II WEB APPLICATIONS

UNIT III SPEECH APPLICATIONS

UNIT IV PDA AND PERVASIVE COMPUTING

UNIT V ADVANCED CONCEPTS

TOTAL: 45

REFERENCES
CC21J DIGITAL IMAGING  
(Common to CSE and CC) 

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

UNIT II  IMAGE ENHANCEMENT  9

UNIT III  IMAGE SEGMENTATION AND ANALYSIS  9

UNIT IV  MULTI RESOLUTION ANALYSIS AND COMPRESSIONS  9

UNIT V  IMAGE REPRESENTATION AND RECOGNITION  9

TOTAL: 45

REFERENCES
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,
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

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

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

TOTAL: 45

REFERENCES
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

UNIT V  ARM COMMUNICATION INTERFACING AND DEVELOPMENT TOOLS  9

TOTAL: 45

REFERENCES
Curriculum & Syllabi of M.E. (CSE) Regulations – 2013

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

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

UNIT III  MODELS            10

UNIT IV  NON PARAMETRIC TECHNIQUES            10

UNIT V  CLUSTERING TECHNIQUES            10

TOTAL: 45

REFERENCES
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**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**


**UNIT II  REPRESENTATION, SELECTION AND SEARCH OPERATORS**


**UNIT III  FITNESS EVALUATION AND CONSTRAINT HANDLING**


**UNIT IV  HYBRID SYSTEM**

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**


TOTAL: 45

**REFERENCES**

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

UNIT II TELECOMMUNICATION SYSTEMS 9

UNIT III WIRELESS NETWORKS 9

UNIT IV NETWORK LAYER 9

UNIT V TRANSPORT AND APPLICATION LAYERS 9

TOTAL: 45

REFERENCES
CEE3E SECURITY IN WIRELESS SENSOR NETWORKS
(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
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
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
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
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
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.

REFERENCES
2. Yong Wang, Garhan Attebury and Byrav Ramamurthy, “A Survey of security issues in wireless
Sensor Networks”, Proc. First International Conference on Wireless Algorithms, Systems, and
Network: a survey”, Australasian Information Security Conference (ACSC2008), Wollongong,
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

UNIT II       ATTACK TAXONOMY

UNIT III      TRUST AND REPUTATION SYSTEMS

UNIT IV       COOPERATION ENFORCEMENT AND DETECTION MECHANISMS

UNIT V        SIMULATION STUDY

TOTAL: 45

REFERENCES
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

UNIT II CROSS-LAYER APPROACHES

UNIT III CROSS-LAYER ARCHITECTURES

UNIT IV APPLIED CROSS-LAYER APPROACHES

UNIT V CASE STUDIES

REFERENCES

TOTAL: 45
CEE3H MODELING AND SIMULATION OF WIRELESS SYSTEMS (Common to CSE and CC) L T P C 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

UNIT IV ESTIMATION OF PARAMETERS IN SIMULATION 9

UNIT V ESTIMATION OF PERFORMANCE MEASURES FROM SIMULATION 9

TOTAL: 45

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

UNIT II  XML TECHNOLOGY  9

UNIT III  WEB SERVICES  9

UNIT IV  SOAP  9

UNIT V  XML SECURITY  9

TOTAL: 45

REFERENCES
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

UNIT V MINING COMPLEX OBJECTS  9

TOTAL: 45

REFERENCES
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

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

UNIT IV IMPLEMENTATION AND VALIDATION OF SOFTWARE QUALITY METRICS 9

UNIT V QUALITY MANAGEMENT STANDARDS 9

TOTAL: 45

REFERENCES
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

UNIT II ONTOLOGY LANGUAGES 9

UNIT III ONTOLOGY CONSTRUCTION 9

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

TOTAL: 45

REFERENCES
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

UNIT II  QUERYING
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

UNIT IV  MULTIMEDIA INFORMATION RETRIEVAL
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

TOTAL: 45

REFERENCES
CEE3P PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS

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

UNIT II QUEUING NETWORK MODELING

UNIT III BOUNDS ON PERFORMANCE

UNIT IV MEMORY

UNIT V PARAMETERIZATION

REFERENCES
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

UNIT III  KNOWLEDGE BASED AGENTS  10

UNIT IV  PLANNING AND PROBABLISTIC AGENTS  10

UNIT V  LEARNING AGENTS  10

TOTAL: 45

REFERENCES
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

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

UNIT IV  MULTIDIMENSIONAL VISUALIZATION  9

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
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


UNIT II    JAVA COMPONENT TECHNOLOGIES


UNIT III   CORBA TECHNOLOGIES


UNIT IV    COM AND .NET TECHNOLOGIES


UNIT V    COMPONENT FRAMEWORKS AND DEVELOPMENT

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

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

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

UNIT IV COALITION GAME THEORY 9

UNIT V EVOLUTIONARY GAME THEORY 8

TOTAL: 45

REFERENCES
**CEE3V  NETWORK CONGESTION CONTROL AVOIDANCE TECHNIQUE**  

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**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**  

**UNIT II  CONGESTION CONTROL IN NETWORK LAYER**  

**UNIT III  CONGESTION CONTROL IN FRAME RELAY**  

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

**UNIT V  CONGESTION AVOIDANCE MECHANISM**  

**REFERENCES**

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

UNIT II PKI ALGORITHMS 8

UNIT III DESIGN, IMPLEMENTATION AND MANAGEMENT 10

UNIT IV E-COMMERCE SECURITY THREATS 9

UNIT V APPLICATIONS OF PKI 8

TOTAL: 45

REFERENCES
COURSE: WIRELESS MAN

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
Advantages of WiMAX – WiMAX compared to 802.11 Wi-Fi, WiMAX Compared 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
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

UNIT IV OVERVIEW TO WIMAX RADIO
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
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
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
3. Cornel TAL group – (www.cs.cornel.edu/talc/)
4. Peter Lee (PCC) – (www.2.cs.cmu.edu/petel/papers/pccp)
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
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 PERVERSIVE COMPUTING

UNIT III QUANTUM COMPUTATION
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
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

TOTAL: 45 PERIODS

REFERENCES