REGULATIONS - 2015

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABI OF
M.E. – COMPUTER SCIENCE AND ENGINEERING
# M.E – Computer Science and Engineering

## CURRICULUM & SYLLABUS

**Regulations 2015**

### SEMESTER – I

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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE: 70**
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FORMAT FOR COURSE CODE

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Compulsory Course
Course Sequence Number
Semester Number
Specialization Name
Year of Regulation

1 5 C T 0 1 E

Elective Course
Course Sequence Number
Specialization Name
Year of Regulation
15CT11C MATHEMATICAL FOUNDATIONS FOR COMPUTER PROFESSIONALS  L T P C  
3 2 0 4

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: enrich and apply the knowledge of matrix theory concepts in image processing.(K1,A2)
CO 2: use set theory principles in complex relational database management systems.(K3,A2)
CO 3: understand and apply mathematical foundations, algorithmic principles and computer science theory in network security.(K4,A3,S5)
CO 4: identify and apply appropriate mathematical transform techniques in signal processing and wavelet.(K4,A3,S5)

UNIT I ADVANCED MATRIX THEORY  15

UNIT II SET THEORY  15

UNIT III GRAPH THEORY AND ALGORITHMS  15

UNIT IV NUMBER THEORY  15

UNIT V MATHEMATICAL TRANSFORMS  15

L: 45 T: 30 TOTAL: 75 PERIODS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1: analyze the algorithm's efficiency of any given problem. (K4)
  CO 2: apply different algorithmic design techniques to solve the problem. (S2, K3)
  CO 3: use various efficient optimization techniques and parallel algorithms to reduce space complexity. (S5, K2)
  CO 4: develop different approximation algorithm for P and NP class Problems. (S3, A2)

UNIT I  ANALYSIS OF ALGORITHMIC PERFORMANCE 9
Introduction of Analysis of algorithm - Average and worst case analysis - Probabilistic and Randomized algorithm - Computation Analysis - Algorithm Redesign and Adaptation - Asymptotic Notation - Amortized Efficiency.

UNIT II  ALGORITHMIC DESIGN TECHNIQUES 9

UNIT III  EFFICIENT DATA PROCESSING 9

UNIT IV  PROBABILISTIC & PARALLEL ALGORITHMS 9

UNIT V  COMPUTATIONAL COMPLEXITY & APPROXIMATION ALGORITHMS 9

L: 45 TOTAL: 45 PERIODS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: demonstrate the knowledge of working in Linux Operating System environment.  
(K3,A2)
CO 2: design and implement a web based applications using PHP and MySQL.(S2,K3)
CO 3: emulate the applications using android. (K3,A2)

UNIT I  INTRODUCTION
Overview: Evolution and Development of Open Source Technologies (OST) and Contemporary 
Technologies - Factors Leading to its Growth - Open Source Initiative - Free Software 
Foundation and the GNU Project - Principle and Methodologies - Indian Contexts of OST - 
Applications - Pros and Cons of OST.

UNIT II  LINUX
Overview of Linux Operating System - Linux Distribution - Graphical Environment and Terminal 
Windows - Linux Graphical Desktop – Shell Scripts - File System Concepts – Process 
Management - Managing File with Graphical Utilities. Linux OS Variants - Case study on BOSS 
(Bharat Operating System Solutions) Linux.

UNIT III  PHP
PHP Introduction - General Syntactic Characteristics - PHP Scripting - Primitives - Operations 
and Expressions - PHP Variables - Control Statements - Array - Functions - Basic Form 
Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP.

UNIT IV  WEB SERVERS AND DATABASES
Web Server: Introduction – Functionalities - XAMPP: Configuration and Administration - MySQL: 
Introduction - Database and Table Creation - Querying - Table Joins - Loading and Dumping a 
Database.

UNIT V  ANDROID PROGRAMMING
Introduction - Setting up Android Environment - Basic Building Blocks - Components: User 
Interface Design – Communication - Content Providers - Application Development.

REFERENCES
1. James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, 
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing ", Oreily 
Inc, 2005.
4. Steve Suehring, Tim Converse, Joyce Park, “PHP6 and MySQL Bible”, John Wiley & Sons, 
2009.
and Eclipse”, O'Reilly Media, 2014.
15CT14C ADVANCED DATABASES

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: apply principles of query optimization to database schema in distributed database. (A2,K3,S5)
CO 2: design queries against spatial and temporal database. (K5,A5)
CO 3: access spatial databases, temporal databases and spatiotemporal database. (K2,A2,S2)
CO 4: understand concepts of multimedia database and design the image, text, audio and video database (K2,S2)
CO 5: construct XML databases. (A2,K3,S5)

UNIT I DISTRIBUTED DATABASES

UNIT II SPATIAL AND TEMPORAL DATABASES

UNIT III MOBILE DATABASES
Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models

UNIT IV MULTIMEDIA DATABASES

UNIT V XML DATABASES

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT15C  ADHOC AND WIRELESS SENSOR NETWORKS L T P C 3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1: identify different issues in wireless ad hoc and sensor networks. (K1,K4)
  CO 2: analyze protocols developed for ad hoc and sensor networks. (K4)
  CO 3: identify and understand security issues in ad hoc and sensor networks. (K1,K5)

UNIT I  MAC & ROUTING IN AD HOC NETWORKS 9

UNIT II  TRANSPORT & QOS IN AD HOC NETWORKS 9

UNIT III  MAC & ROUTING IN WIRELESS SENSOR NETWORKS 9

UNIT IV  TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

UNIT V  SECURITY IN AD HOC AND SENSOR NETWORKS 9

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT16C NETWORK SIMULATION LABORATORY L T P C 0 0 4 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO 1: understand and use the concept of network simulator. (K1,K3)
- CO 2: apply different topology and algorithms in the networking applications. (K3)
- CO 3: apply simulator concept in wired and wireless networks. (K3)

List of Experiments

1. Create 20 nodes using simulation to measure the throughput of a wired network.
2. Create 50 nodes to implement a TCP scenario with Congestion avoidance using Slow Start mechanism.
3. Create 50 nodes to implement a TCP scenario with Congestion Control using Fast Retransmit - Fast Recovery mechanism.
4. Create 50 nodes to implement the UDP and study the performance using NS2.
5. Create 20 nodes using simulation to measure the link failure in wired network.
6. Create a script that simulates simplest Topology such as Bus, Star, Ring, and Tree.
7. Calculate End to End delay, Throughput, routing overhead for wireless network using awk script in NS2.
8. Generate xgraph for Packet Delivery Ratio (PDR), End to End delay, Throughput in NS2.
9. Create a simple 3 node wireless topology. The nodes use Destination Sequenced Distance Vector (DSDV) Protocol to route packets among themselves.
10. Detect Black hole, Worm hole, Gray hole attacks in MANET using NS2.

Software Required: NS2
15CT17C     OPEN SOURCE AND DATA BASE LABORATORY     L T P C
0 0 4 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: work efficiently as a system administrator in Linux environment (K4,A2)
   CO 2: retrieve, insert, update, and delete data from the relational database MySQL (S2,K3)
   CO 3: use the features of PHP in connection with MySQL (A2,K3)
   CO 4: develop an Android Application with XML database connectivity (S2,K3)

List of Experiments
1. Study of Linux File System Management
   • Check and change the execute permissions of existing files and directories. Check current setting of umask and list the Hard link and symbolic link of a file with relative and absolute address specification.
   • Find the ip address of the Ethernet Network Interface 'eth0' and configure a different ip address. Also list the number of users on particular server
   • Replace user name with name of college and store the file in the new version and get home directory of user by using awk. Also search and replace file using sed.
2. XAMPP - Install and configure XAMPP Web server
3. MySQL - Build a Student Tracking System with necessary Tables as listed below
   • Students Table and staff Table with necessary fields
   • Staff Table to Report of students by UG – Branch, Generate email list by UG – Branch, Enter comment about student, View info about student, Remove a Student, Add/View Internal Assessment Marks, GPA and CGPA
4. Create a trigger that displays a message prior to an insert operation on the Student or Staff table. Create a trigger that whenever an insert, update, or delete operation occurs on the table, a row is added to the table recording the date, user, and action.
5. Develop a webpage that collects the User Name (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Should use a super global variable, Redirecting user and Uploading a file using form and PHP script. Messages in the alert windows must be produced when errors are detected.
6. PHP with Database - Modify the Student Tracking System with User Authentication based Information. Individual should be able to reset password.
7. Develop a PHP web page that maintains a Session to remember login id from form to form and remember if faculty or admin has rights from form to form (Managing role based access using session and destroying session.)
8. Study of ANDROID Emulator
9. Simple Applications with Multiple Activities in Android- Design a page to store information about a student. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a form used to display the document.
10. Creating Activities for menu items with parsing XML files – The staff and students should be able to see the Internal Assessment marks, CGPA and GPA as per semester details entered.

P: 60 TOTAL: 60 PERIODS

Software Required: Cent OS 6.3, XAMPP, MYSQL, PHP, Android emulator 2.0
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: describe big data and its importance. (A1,S1)
CO 2: explain the NoSQL big data management. (K2,A2)
CO 3: perform map-reduce analytics using Hadoop. (K3,A2)
CO 4: understand the technologies Pig and Hive for big data analytics. (A1,K1)

UNIT I  INTRODUCTION
Basics of big data – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics.

UNIT II  NoSQL DATA MODEL
Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – Graph databases - schemaless databases – distribution models – master-slave replication – peer-peer replication – sharing and replication – Case Study: MongoDB.

UNIT III  HADOOP

UNIT IV  MAP REDUCE APPLICATIONS

UNIT V  RELATED TOOLS

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT22C          DATA MINING AND DATA WAREHOUSING                  L     T     P     C
                                      3     2     0     4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: apply the functionalities of data warehousing and data mining in real time
applications. (K3)
CO 2: do the preprocessing and apply association rule concepts in real time
systems. (K3,S3)
CO 3: implement the various classification and clustering methods. (K4,A3)
CO 4: analyze the different types of mining. (K3,K4)

UNIT I  INTRODUCTION              15
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             15
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                        15
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                                      15
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 AND TOOLS                      15
Multidimensional analysis – Descriptive mining of complex data objects – Spatial data mining –
Tool.

L: 45 T: 30 TOTAL: 75 PERIODS

REFERENCES
PRINCIPLES OF CLOUD COMPUTING

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: identify the architecture, infrastructure and delivery models of cloud computing (A2,K2)
CO 2: apply suitable virtualization concept.(K3)
CO 3: choose the appropriate Programming Models and approach for Services.(K4,S3)
CO 4: address the core issues of cloud computing such as security, privacy and interoperability (A2,K4)

UNIT I  FUNDAMENTALS  7

UNIT II  VIRTUALIZATION  10

UNIT III  CLOUD ARCHITECTURE AND SERVICES  9

UNIT IV  SECURITY IN THE CLOUD  9

UNIT V  CLOUD PLATFORMS AND TOOLS  10

REFERENCES
15CT24C  ADVANCED NETWORK SECURITY  L T P C
                                  3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1: apply the mathematical foundations in security principles. (K3)
  CO 2: identify the features of encryption and authentication. (K1,K5)
  CO 3: develop the Network Security Applications. (K3)

UNIT I  SYMMETRIC KEY CRYPTOGRAPHY  9
Substitutional Ciphers- Transposition Ciphers - Data Encryption Standard (DES) - Triple DES-
Block Cipher modes of operation - AES Cipher.

UNIT II  PUBLIC KEY CRYPTOGRAPHY  9
Introduction to Number Theory: Modular Arithmetic- Euclid’s Algorithm- Fermat’s and Euler’s
Theorems - The Chinese Remainder Theorem and Discrete Logarithms. Public Key
Cryptography and RSA - Key Management - Diffie-Hellman key Exchange.

UNIT III  AUTHENTICATION  9
Hash Algorithms:  MD5 Message Digest Algorithm - Secure Hash Algorithm – RIPEMD-160 –

UNIT IV  NETWORK SECURITY APPLICATIONS  9
Kerberos - Web Security: Web Security issues- Secure Sockets Layer (SSL) and Transport
Layer Security (TLS) - Secure Electronic Transaction (SET). Electronic Mail Security: PGP -
S/MIME.

UNIT V  SYSTEM LEVEL SECURITY  9
Intrusion detection - password management - Viruses and related Threats - Virus Counter
measures - Firewall Design Principles - Trusted Systems.

L: 45 TOTAL: 45 PERIODS

REFERENCES
During the seminar session each student is expected to prepare and present a topic on engineering / technology, for duration of about 15 to 20 minutes. Each student is expected to present at least twice during the semester and the student is evaluated based on the presentation skill, concept and Query clarification. At the end of the semester, he/she can submit a report on his/her topic of seminar and marks are given based on the report. A Faculty is to be allotted and he/she will guide and monitor the progress of the student and maintain the attendance also. The seminar will be assessed by a committee appointed by the department.

P: 60 TOTAL: 60 PERIODS
15CT26C                BIG DATA LABORATORY                L  T  P  C
                                      0  0  4  2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: develop a map reduce program for parallel tasks. (S2,K3)
   CO 2: work with various data processing tools for big data. (K4,S3)
   CO 3: understand the technologies Pig and Hive for big data analytics. (A1,K3)
   CO 4: analyze and process data using Data Meer. (K4)

List of Experiments

1. Installation of Apache Hadoop using Hortonworks Data Platform
2. Develop a map reduce program for word count
3. Big Data processing with Hive and HCatalog
4. Query Processing using Hive and Beeswax
5. Writing data processing scripts using Pig
6. Using command line to manage HDFS
7. Work with snapshot creation on HDFS
8. Installation of clustered Hadoop and mapreduce
9. Classification analysis using Data Meer
10. Clustering analysis using Data Meer
11. Data Visualization using Data Meer

                        P: 60 TOTAL: 60 PERIODS

Software Required: Hadoop 20.0, Data Meer 2.0, Eclipse IDE, Java
15CT01E  WAVELETS AND MULTIRESOLUTION PROCESSING  L  T  P  C  
(Common to CS and CSE)  3  0  0  3

COURSE OUTCOMES
Upon completion of this course, the student will be able to
CO 1: Choose the desired transforms for different image processing application. (K1- K3)
CO 2: Analyze Wavelet Packets. (K1 –K4)
CO 3: Design Wavelets for specific application. (K1- K5)

UNIT I  VECTOR SPACES AND SIGNAL SPACES  9

UNIT II  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 III  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, Sine, Gaussian, Bi-Orthogonal) - Tiling of time-scale plane for CWT.

UNIT IV  DISCRETE WAVELET TRANSFORMS  9

UNIT V  WAVELET APPLICATIONS  9

L:45  TOTAL: 45 PERIODS

REFERENCES
15CT02E                            DISTRIBUTED COMPUTING

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: apply the Distributed operating system’s concept in distributed Environment. (K3)
   CO 2: identify the problems in developing distributed applications.(K1,K5)
   CO 3: recognize the feasibilities and the impossibilities in managing resources.(K4)

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 –

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.

REFERENCES
1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and
3. Hagit Attiya and Jennifer Welch, “Distributed Computing: Fundamentals, Simulations and
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: acquire the knowledge about pervasive computing concepts.(A1,K1,S3)
CO 2: identify various web and search applications. (K4,S5)
CO 3: understand the voice standards and speech applications.(A1,K1)
CO 4: acquainted with the issues and emerging trends in pervasive computing.(A2,S4,S5)

UNIT I  INTRODUCTION
Pervasive computing infrastructure-applications- Device Technology - Hardware, Human-machine Interfaces, Biometrics, and Operating systems– Device Connectivity – Protocols, Security, and Device Management- Pervasive Web Application architecture- Access from PCs and PDAs - Access via WAP.

UNIT II  WEB APPLICATIONS

UNIT III  SPEECH APPLICATIONS

UNIT IV  PDA AND PERVASIVE COMPUTING

UNIT V  ADVANCED CONCEPTS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: understand the fundamentals of image processing. (K2,S2)
CO 2: implement the various image enhancement and image compression
techniques. (A3,K3,S5)
CO 3: exemplify image analysis concepts: segmentation, edge detection and corner
detection. (S5,K6)
CO 4: perform registration and fusion techniques. (A3,K3,S5)

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9
Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and
Quantization – Pixel Relationships – Image operations – Spatial Domain: Histograms –
Smoothing and Sharpening – Frequency Domain: Fourier Transform (DFT and FFT) –
Frequency domain noise filters.

UNIT II  SEGMENTATION AND EDGE DETECTION  9
Thresholding techniques – region growing methods – region splitting and merging – adaptive
thresholding – threshold selection – global valley – histogram concavity – edge detection –
template matching – gradient operators – circular operators – differential edge operators –
Canny operator – Laplacian operator – active contours – object segmentation

UNIT III  INTEREST POINTS, MORPHOLOGY, AND TEXTURE  9
Corner and interest point detection – template matching – second order derivatives – median
filter based detection – Harris interest point operator – corner orientation – local invariant feature
detectors and descriptors – morphology – dilation and erosion – morphological operators –
grayscale morphology – noise and morphology – texture – texture analysis – co-occurrence
matrices

UNIT IV  MULTI RESOLUTION ANALYSIS AND COMPRESSION  9
Compression – Lossy Compression – Compression Standards.

UNIT V  REGISTRATION AND IMAGE FUSION  9
Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature
corespondence-Point pattern matching, Line matching, region matching Template matching.
Transformation functions - Resampling- Nearest Neighbour and Cubic Splines. Image Fusion-
Overview of image fusion, pixel fusion, Multiresolution based fusion - Region based fusion.

REFERENCES
4. Ardeshir Goshtasby, “2D and 3D Image registration for Medical, Remote Sensing and
### COURSE OUTCOMES
Upon completion of this course, the students will be able to

- **CO 1:** get broad overview of the theoretical foundations of computer science (K1)
- **CO 2:** familiar with thinking analytically and intuitively for problem solving situations in related areas of theory of computer Science (K4)
- **CO 3:** define and describe formal models of computation, such as finite automata, pushdown automata, and Turing machines. (K1)
- **CO 4:** demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.(K6)

### UNIT I  AUTOMATA  

### UNIT II  REGULAR EXPRESSIONS AND LANGUAGES  
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 LANGUAGE  

### UNIT IV  PROPERTIES OF CONTEXT FREE LANGUAGE  
Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines (TM) – Programming Techniques for TM.

### UNIT V  UNDECIDABILITY  
Non Recursive Enumerable Language – Recursive Enumerable Language – Undecidable Problems about TM – Post’s Correspondence Problem – The Class P and NP.

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### REFERENCES
15CT06E SOFTWARE PROJECT MANAGEMENT

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: produce the quality product without defects. (K4,A2)
   CO 2: complete the task with better quality on time. (A2,S3)
   CO 3: manage the people and control the defects. (K5,A3)

UNIT I BASIC CONCEPTS

UNIT II FORMAT PROCESS MODELS AND THEIR USE
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

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

UNIT V ENGINEERING AND ISSUES IN PROJECT MANAGEMENT

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO 1: develop a language model. (K3,A2,S2)
- CO 2: build a tagger to semantically tag words using WordNet. (K5,A4)
- CO 3: implement a parser by providing suitable grammar and words. (K5,A2,S5)
- CO 4: perform syntax and semantic analysis using language analysis tools. (K4,S2)
- CO 5: design and evaluate the NLP applications. (K6)

UNIT I  OVERVIEW AND LANGUAGE MODELING

UNIT II  PART-OF-SPEECH TAGGING AND CONTEXT-FREE GRAMMARS

UNIT III  PARSING AND ADVANCED FEATURES

UNIT IV  SEMANTICS ANALYSIS AND LEXICAL SEMANTICS

UNIT V  EVALUATION METRICS AND MEASURES

L: 45 TOTAL: 45 PERIODS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems (A2,K3,S5)
CO 2: implement neural networks to pattern classification and regression problems. (A2,K3,S5)
CO 3: apply genetic algorithms to combinatorial optimization problems. (A3,K4)
CO 4: effectively use of existing software tools to solve real problems using a soft computing approach (K5,A5)

UNIT I  FUZZY SYSTEMS  9

UNIT II  ARTIFICIAL NEURAL NETWORKS  9

UNIT III  NEURO - FUZZY MODELING  9

UNIT IV  GENETIC ALGORITHMS  9

UNIT V  APPLICATIONS  9

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: develop the web applications for any real time systems. (K2)
CO 2: write client side script for the design of GUI based applications.(K2,A4)
CO 3: develop server side programming languages using Servlets, ASP and JSP and
connect databases. (K3,A4,S3)

UNIT I  INTRODUCTION                 9

UNIT II  DYNAMIC HTML                 9
Object model and collections – Event model – Filters and Transitions – Data binding – Data
control.

UNIT III  SCRIPTS AND APPLETS         9

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.

REFERENCES
1. Harvey M. Deitel, Paul J. Deitel and Abbey Deitel, "Internet and World Wide Web - How to
2006.
Media, 2011.
COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO 1: apply the mathematical foundations for recognition of patterns. (K3)
- CO 2: identify the pattern Recognition models. (K1,K6)
- CO 3: apply the non parametric techniques and clustering techniques in pattern Recognition in real time applications. (K3)

UNIT I INTRODUCTION

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

UNIT III MODELS

UNIT IV NON PARAMETRIC TECHNIQUES

UNIT V CLUSTERING TECHNIQUES

REFERENCES
15CT11E MOBILE COMPUTING

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: grasp the concepts and features of mobile computing technologies and applications. (K1)
CO 2: have a good understanding of how the underlying wireless and mobile communication networks work, their technical features and what kind of applications they can support. (K3, K4)
CO 3: identify the important issues of developing mobile computing systems and applications. (K1, K4)
CO 4: organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities. (K3, K5)

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS

UNIT II TELECOMMUNICATION SYSTEMS

UNIT III WIRELESS NETWORKS

UNIT IV NETWORK LAYER

UNIT V TRANSPORT AND APPLICATION LAYERS

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT12E                  XML AND WEB SERVICES                  L T P C
                                3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: develop XML based Web Systems. (K2)
   CO 2: apply the different technologies of XML in real time applications. (K3)
   CO 3: convert web applications into Web Services (K4,A4)
   CO 4: use Web Services components in XML based applications (K3,S3)

UNIT I  INTRODUCTION
Role of XML – XML and the Web – XML Language Basics – Comparison with HTML – XML

UNIT II  XML TECHNOLOGY

UNIT III WEB SERVICES

UNIT IV SOAP

UNIT V XML SECURITY

REFERENCES
15CT13E SOFTWARE QUALITY ASSURANCE

COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1: produce the quality product without defects. (K4,A2)
  CO 2: complete the task with effective testing methods. (A2,S3)
  CO 3: apply the metrics and standards for the product. (K3,A2)

UNIT I INTRODUCTION
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
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
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
Hierarchical models of software quality – software quality metrics – Product quality metrics
  InProcess 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 STANDARD
Project progress control – Costs – Quality management standards – Project process standards
  – Management and its role in SQA – SQA unit.

L: 45 TOTAL: 45 PERIODS

REFERENCES
3. Srinivasan Desikan and Gopalaswamy Ramesh, “Software testing – principles and
   2006.
15CT14E  ONTOLOGY AND SEMANTIC WEB  L T P C
3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: understand the essentials of ontology.(A1,K1)
CO 2: acquire knowledge about ontology languages (A1,S3)
CO 3: apply the tools to construct ontology (K3,A2,S5)
CO 4: identify the applications of semantic web.(S4,S5)

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

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT15E INFORMATION RETRIEVAL TECHNIQUES L T P C
3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO 1: know about pattern matching algorithms and multimedia Information Retrieval. (A1,K2)
   CO 2: study the query languages, data models and applications. (K3,A2)
   CO 3: learn the big data analytics and create statistical models. (K3,S2)

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

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: visualize the objects in different dimensions. (K1,K4)
CO 2: design and process the data for Virtualization. (K1,K3,S5)
CO 3: apply the visualization techniques in physical sciences, computer science, applied
mathematics and medical sciences. (K1,K3,S5)
CO 4: apply the virtualization techniques for research projects. (K1,K3)

UNIT I  INTRODUCTION AND DATA FOUNDATION  9
Basics - Relationship between Visualization and Other Fields - The Visualization Process -
Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within
and between Records - Data Preprocessing - Data Sets

UNIT II  FOUNDATIONS FOR VISUALIZATION  9
Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical
Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance
theory – A Model of Perceptual Processing.

UNIT III  VISUALIZATION TECHNIQUES  9
Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data -
Dynamic Data - Combining Techniques. Geospatial Data: Visualizing Spatial Data -
Visualization of Point Data - Visualization of Line Data - Visualization of Area Data - Other
Issues in Geospatial Data Visualization Multivariate Data: Point-Based Techniques - Line-
Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees
Displaying Hierarchical Structures – Graphics and Networks - Displaying Arbitrary
Graphs/Networks.

UNIT IV  INTERACTION CONCEPTS AND TECHNIQUES  9
Text and Document Visualization: Introduction - Levels of Text Representations - The Vector
Space Model - Single Document Visualizations - Document Collection Visualizations - Extended
Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and
Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space - Data
Space - Attribute Space - Data Structure Space - Visualization Structure - Animating
Transformations - Interaction Control

UNIT V  RESEARCH DIRECTIONS IN VIRTUALIZATIONS  9
Steps in designing Visualizations – Problems in designing effective Visualizations - Issues of
and Applications.

L: 45 TOTAL : 45 PERIODS

REFERENCES
1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Margon
15CT17E  NETWORK CONGESTION CONTROL AVOIDANCE TECHNIQUES  

**COURSE OUTCOMES**  
Upon completion of this course, the students will be able to  
CO 1: identify congestion problems in Network Layer.(S3)  
CO 2: analyse the congestion control and flow control algorithm.(K4)  
CO 3: apply the congestion avoidance mechanism in network traffic problem.(K3,A3)  

**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**  

**L: 45 TOTAL: 45 PERIODS**  

**REFERENCES**  
15CT18E TRUSTED SERVICES AND PUBLIC KEY INFRASTRUCTURE L T P C
3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO 1: understand the challenges behind the development of public key algorithms. (K4,A3)
CO 2: develop security system for online business transactions. (K3,A4)

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

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT19E  SPEECH AND LANGUAGE TECHNOLOGY  L T P C
3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: acquire knowledge of speech and signal systems and explore parameters of
speech.(K1,S2,A1)

CO 2: implement a speech recognition system using HMM models and design a speech
synthesizer. (K5,S5)

CO 3: demonstrate practical competencies of speech and language systems.(K4,S5)

UNIT I  INTRODUCTION 10
The human speech production mechanism – LTI model for speech production – Nature of the
speech signal – Linear Time-Varying model – Phonetics – Types of speech – Voiced and
unvoiced decision making – Audio file formats: Nature of the WAV file.

UNIT II  PARAMETERS OF SPEECH 10
Fundamentals frequency or pitch frequency – Parallel processing approach for calculation of
pitch frequency – Pitch period measurement using spectral domain – Cepstral domain –
Formants and their relation with LPC – Evaluation of formants: cepstrum and log spectrum –
Cepstral analysis of speech: Cepstral Coefficients – Mel Frequency Cepstral Coefficients.

UNIT III  SPEECH RECOGNITION 9
Speech recognition architecture – Overview of Hidden Markov Models – The Viterbi algorithm –
Advanced methods for decoding – Acoustic processing of speech – Computing acoustic
probabilities – Training a speech recognizer – Waveform generation for speech synthesis –
Human speech recognition.

UNIT IV  SPEECH SYNTHESIS 8
A Text-to-Speech system – Synthesizer technologies – Speech synthesis using other methods
– Speech transformations – Emotion recognition from speech.

UNIT V  EVALUATION METRICS AND MEASURES 8
NIST Metric – Word Error Rate – Classification Error Rate – Precision and Recall – Receiver
Operating Characteristics Curves – Precision-recall curve – Detection Error Tradeoff curve –
Area Under the curves – Bi-Lingual Evaluation Understudy – Metric for Evaluation of Translation
with Explicit Ordering – Human Translation Error Rate – Semantic Translation Error Rate –
Translation Error Rate.

L: 45 TOTAL: 45 PERIODS

REFERENCES
   Education, 2011.
5. Sherri Condon, Mark Arehart, Christy Doran, Dan Parvaz, John Aberdeen, Karine
   Megerdoomian, Beatrice Oshika, and Greg Sanders, “Automated Metrics for Speech
   Translation”, The MITRE Corporation and National Institute of Standards and Technology,
   Boundary Detection”, 2010.
COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: Describe the Medical image fundamentals and its reconstruction (K1-K2)
CO 2: Describe medical image formats and its processing (K1-K2)
CO 3: Discuss the image registration and visualization (K1-K2)
CO 4: Classify the medical image segmentation procedures (K1-K3)
CO 5: Explain ultrasound, PET and SPECT imaging methods (K1-K4)

UNIT I: INTRODUCTION
Introduction to medical imaging technology, systems, and modalities. Brief history; importance; applications; trends; challenges. Medical Image Formation Principles: X-Ray physics; X-Ray generation, attenuation, scattering; dose Basic principles of CT; reconstruction methods; artifacts; CT hardware. Magnetic Resonance Imaging (MRI), Mathematics of MR; spin physics; NMR spectroscopy; imaging principles and hardware.

UNIT II: STORAGE AND PROCESSING
Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS); Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding; contrast enhancement; SNR characteristics; filtering; histogram modeling.

UNIT III: IMAGE REGISTRATION AND VISUALIZATION
Rigid body visualization, Principal axis registration, Interactive principal axis registration, Feature based registration, Elastic deformation based registration, Medical image fusion, Image visualization – 2D display methods, 3D display methods, virtual reality based interactive visualization. Image artifacts.

UNIT IV: SEGMENTATION AND CLASSIFICATION
Medical Image Segmentation - Histogram-based methods; Region growing and watersheds; Markov Random Field models; active contours; model-based segmentation. Multi-scale segmentation; semi-automated methods; clustering-based methods; classification-based methods; atlas-guided approaches; multi-model segmentation. Medical Image Registration Intensity-based methods; cost functions; optimization techniques.

UNIT V: NUCLEAR IMAGING
PET and SPECT Ultrasound Imaging methods; mathematical principles; resolution; noise effect; 3D imaging; positron emission tomography; single photon emission tomography; ultrasound imaging; applications. Medical Image Search and Retrieval Current technology in medical image search, content-based image retrieval, new trends: ontologies. Applications. Other Applications of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems.

L:45 TOTAL: 45 PERIODS
REFERENCES
15CT21E  MACHINE LEARNING TECHNIQUES  L  T  P  C
        3  0  0  3

COURSE OUTCOMES
Upon completion of this course, the students will be able to

- CO 1: implement a neural network for an application. (K4,S5)
- CO 2: implement probabilistic discriminative and generative algorithms for an application and analyze the results. (K4,A2)
- CO 3: implement typical clustering algorithms for different types of applications. (K4,A4)
- CO 4: design and implement an HMM for a sequence model type of application. (K5)
- CO 5: identify applications suitable for different types of machine learning with suitable justification. (K4,A4)

UNIT I  INTRODUCTION  9

UNIT II  SUPERVISED LEARNING  9

UNIT III  UNSUPERVISED LEARNING  9

UNIT IV  PROBABILISTIC GRAPHICAL MODELS  9

UNIT V  ADVANCED LEARNING  9

REFERENCES
15CT22E  COGNITIVE SCIENCE  L T P C  3 0 0 3

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO 1: explain, and analyze the major concepts, philosophical and theoretical perspectives, empirical findings, and historical trends in cognitive science, related to cultural diversity and living in a global community.(S3,K4)

CO 2: use cognitive science knowledge base to create their own methods for answering novel questions of either a theoretical or applied nature, and to critically evaluate the work of others in the same domain. (A4,K4)

CO 3: proficient with basic cognitive science research methods, including both theory-driven and applied research design, data collection, data analysis, and data interpretation.(K1)

UNIT I  INTRODUCTION TO COGNITIVE SCIENCE  9

UNIT II  COGNITIVE PSYCHOLOGY  10

UNIT III  COGNITIVE NEUROSCIENCE  8

UNIT IV  LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODE  10

UNIT V  HIGHER-LEVEL COGNITION  8

L: 45 TOTAL: 45 PERIODS

REFERENCES
15CT23E GREEN COMPUTING

COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1: acquire knowledge to adopt green computing practices to minimize negative impacts
    on the environment. (K4,A2)
  CO 2: acquire skills in energy saving practices in their use of hardware and examine
    technology. (K3,S1)
  CO 3: use of Tools that can reduce paper waste and carbon footprint by user, and to
    understand how to minimize equipment disposal requirements. (S4,A2)

UNIT I FUNDAMENTALS
Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot
print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally

UNIT II GREEN ASSETS AND MODELING
Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process
Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture –
Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and
Development Models.

UNIT III GREEN FRAMEWORK
Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and
teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid
framework.

UNIT IV GREEN COMPLIANCE
Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green
Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and
Future.

UNIT V CASE STUDIES
Strategies for adopt Green Computing – Scenarios for Trial Runs – Applying Green IT
Strategies and Applications to a Home, Hospital, IT Industry and Telecommunication sector.

L: 45 TOTAL: 45 PERIODS

REFERENCES
   CRC Press, June 2011.
3. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”,
   Shoff/IBM rebook, 2011.
COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO 1: understand the concept of fuzziness. (K2,S2)
- CO 2: acquire adequate knowledge about fuzzy set theory. (K1,A1)
- CO 3: have a good understanding of the techniques for classification and pattern recognition. (K2)
- CO 4: gain hands-on experience of using fuzzy logic. (A2,K3,S5)

UNIT I  CLASSICAL SETS AND FUZZY SETS 7

UNIT II  CLASSICAL RELATIONS AND FUZZY RELATIONS 9

UNIT III  MEMBERSHIP FUNCTIONS AND FUZZIFICATION 9
Features of the Membership Function -Various Forms -Fuzzification -Defuzzification to Crisp Sets -$\lambda$-Cuts for Fuzzy Relations -Defuzzification to Scalars- Development of Membership Functions-Automated Methods for Fuzzy Systems

UNIT IV  FUZZY CLASSIFICATION 11
Classification by Equivalence Relations -Crisp Relations-Fuzzy Relations-Cluster Analysis-Cluster Validity-c-Means Clustering -Hard c-Means (HCM)-Fuzzy c-Means (FCM)-Fuzzy c-Means Algorithm-Classification Metric -Hardening the Fuzzy c-Partition -Similarity Relations from Clustering

UNIT V  FUZZY PATTERN RECOGNITION 9

L: 45 TOTAL: 45 PERIODS

REFERENCES