NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution – Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

www.nec.edu.in

REGULATIONS - 2015

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABI OF

M.E. – COMPUTER SCIENCE AND ENGINEERING

SEMESTER – I

S. No.	Course Category	Course Code	Course Title	L	T	P	C	Question pattern⊕
THEORY COURSES								
1	SFC	15CT11C	Mathematical Foundations for Computer Professionals	3	2	0	4	B
2	PCC	15CT12C	Advanced Algorithms and Analysis	3	0	0	3	B
3	PCC	15CT13C	Open Source Technologies	3	0	0	3	B
4	PCC	15CT14C	Advanced Databases	3	0	0	3	B
5	PCC	15CT15C	Adhoc and Wireless Sensor Networks	3	0	0	3	B
PRACTICAL COURSES								
6	PCC	15CT16C	Network Simulation Laboratory	0	0	4	2	-
7	PCC	15CT17C	Open Source and Database Laboratory	0	0	4	2	-
Total				**15**	**2**	**8**	**20**	-

SEMESTER – II

S. No.	Course Category	Course Code	Course Title	L	T	P	C	Question pattern⊕
THEORY COURSES								
1	PCC	15CT21C	Big Data Analytics and Management	3	0	0	3	B
2	PCC	15CT22C	Data Mining and Data Warehousing	3	2	0	4	B
3	PCC	15CT23C	Principles of Cloud Computing	3	0	0	3	C
4	PCC	15CT24C	Advanced Network Security	3	0	0	3	B
5	PEC		Elective – I	3	0	0	3	-
PRACTICAL COURSES								
6	PCC	15CT25C	Research paper and Patent Review - Seminar	0	0	4	2	-
7	PCC	15CT26C	Big Data Laboratory	0	0	4	2	-
Total				**15**	**2**	**8**	**20**	-

SFC – Specific Foundation Course, PCC – Programme Core Course, PEC – Programme Elective Course, OEC – Open Elective Course
@Common to CS & CSE

SEMESTER – III

S. No.	Course Category	Course Code	Course Title	L	T	P	C	Question pattern⊕
THEORY COURSES								
1	PEC		Elective – II	3	0	0	3	-
2	PEC		Elective – III	3	0	0	3	-
3	PEC		Elective – IV	3	0	0	3	-
4	OEC		Elective – V	3	0	0	3	-
PRACTICAL COURSES								
5	PCC	15CT31C	Project Work (Phase I)	0	0	12	6	-
Total				**12**	**0**	**12**	**18**	**-**

SEMESTER – IV

S. No.	Course Category	Course Code	Course Title	L	T	P	C	Question pattern⊕
PRACTICAL COURSES								
1	PCC	15CT41C	Project Work (Phase II)	0	0	24	12	-
Total				**0**	**0**	**24**	**12**	**-**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE: 70

SFC – Specific Foundation Course, PCC – Programme Core Course, PEC – Programme Elective Course, OEC – Open Elective Course
@Common to CS & CSE

PROGRAMME ELECTIVE COURSES

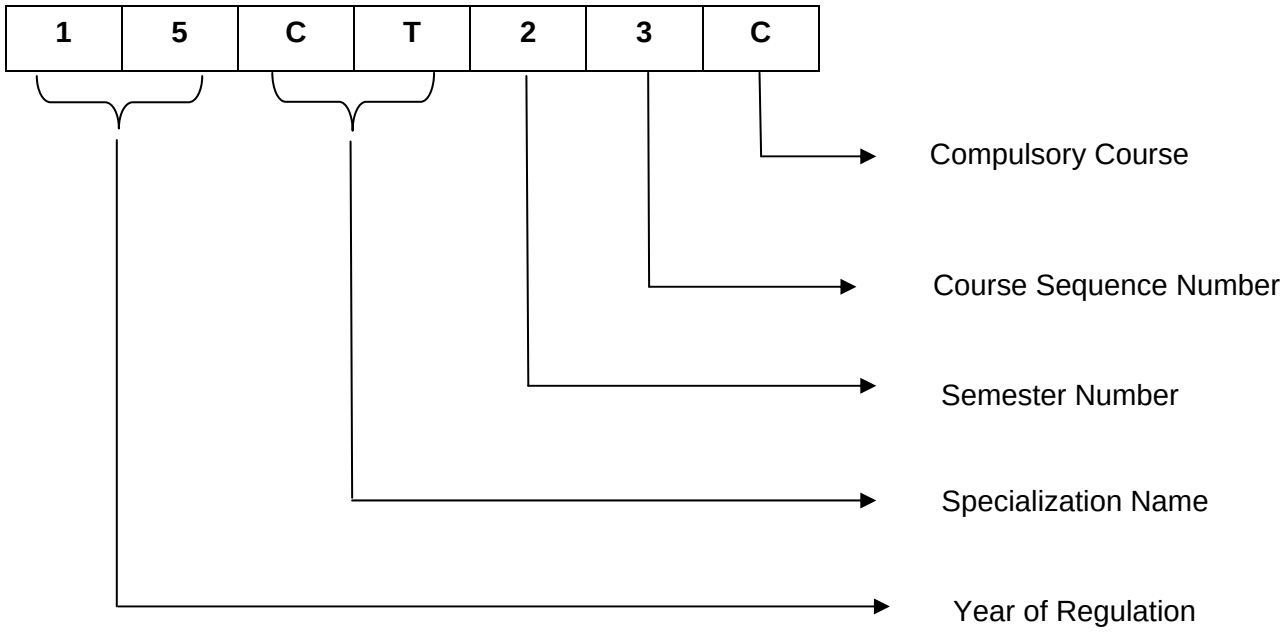
S. No	Course Category	Course Code	Course Title	L	T	P	C	Question pattern⊕
1.	PEC	15CT01E	Wavelet and Multiresolution Processing@	3	0	0	3	B
2.	PEC	15CT02E	Distributed Computing	3	0	0	3	B
3.	PEC	15CT03E	Pervasive Computing	3	0	0	3	B
4.	PEC	15CT04E	Digital Image Processing	3	0	0	3	B
5.	PEC	15CT05E	Theory of Computation	3	0	0	3	B
6.	PEC	15CT06E	Software Project Management	3	0	0	3	B
7.	PEC	15CT07E	Natural Language Processing	3	0	0	3	B
8.	PEC	15CT08E	Soft Computing	3	0	0	3	B
9.	PEC	15CT09E	Internet Programming	3	0	0	3	B
10.	PEC	15CT10E	Pattern Recognition	3	0	0	3	B
11.	PEC	15CT11E	Mobile Computing	3	0	0	3	B
12.	PEC	15CT12E	XML and Web Services	3	0	0	3	B
13.	PEC	15CT13E	Software Quality Assurance	3	0	0	3	B
14.	PEC	15CT14E	Ontology and Semantic Web	3	0	0	3	B
15.	PEC	15CT15E	Information Retrieval Techniques	3	0	0	3	B
16.	PEC	15CT16E	Data Visualization Techniques	3	0	0	3	B
17.	PEC	15CT17E	Network Congestion Control Avoidance Techniques	3	0	0	3	B
18.	PEC	15CT18E	Trusted Services and Public Key Infrastructure	3	0	0	3	B
19.	PEC	15CT19E	Speech and Language Technology	3	0	0	3	B
20.	PEC	15CT20E	Medical Image Processing@	3	0	0	3	B
21.	PEC	15CT21E	Machine Learning Techniques	3	0	0	3	B
22.	PEC	15CT22E	Cognitive Science	3	0	0	3	B
23.	PEC	15CT23E	Green Computing	3	0	0	3	B
24.	PEC	15CT24E	Fuzzy Logic Theory and Its Applications	3	0	0	3	B
25.	OEC		Courses offered by other PG programmes	3	0	0	3	

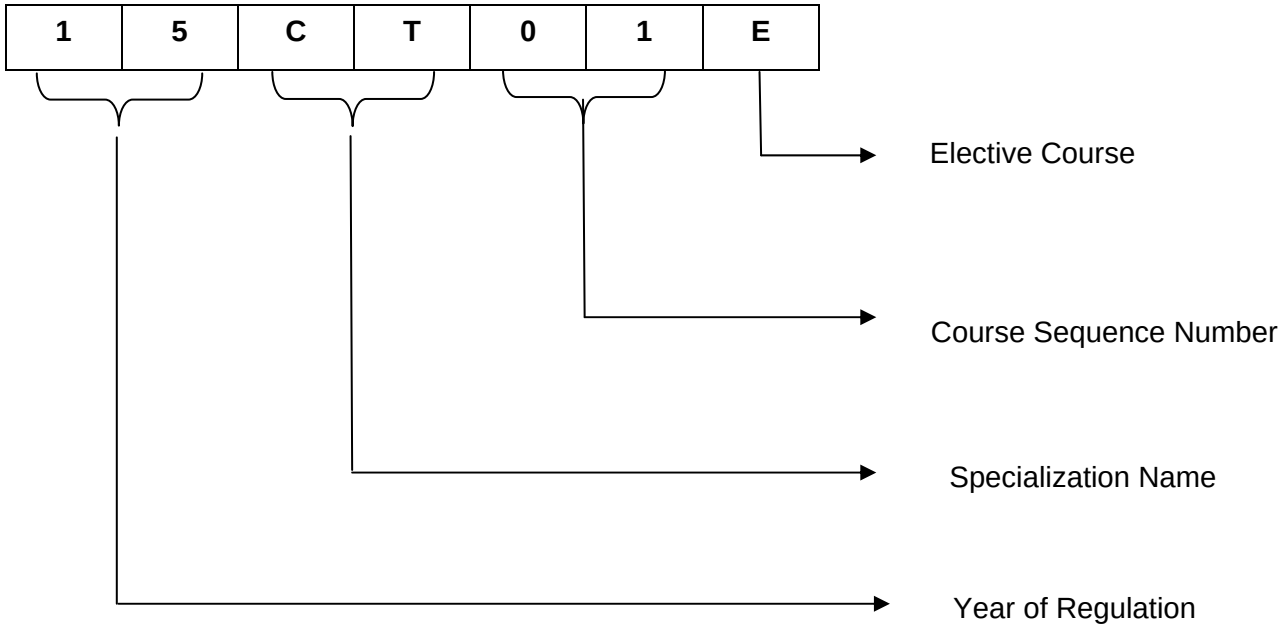
SFC – Specific Foundation Course, PCC – Programme Core Course, PEC – Programme Elective Course, OEC – Open Elective Course
@Common to CS & CSE

⊕

Question pattern	1 mark	2 marks	4 marks	10 marks	12 marks	16 marks	20 marks	Total
A	-	-	-	-	--	-	1 Qn Compulsory & 4 Qns (either or type)	100
B	-	10	-	-	--	1 Qn Compulsory & 4 Qns (either or type)	--	100
C	10	-	10 out of 12	1 Qn Compulsory & 4 Qns (either or type)	--	--	--	100
D	10	10	5 out of 6	1 Qn Compulsory & 4 Qns (either or type)	--	--	--	100
E	-	10	5 out of 6	-	1 Qn Compulsory & 4 Qns (either or type)	--	--	100

FORMAT FOR COURSE CODE





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

Eigen values using QR Transformations – Generalized Eigen Vectors – Canonical Forms – Singular Value Decomposition and Applications – Pseudo Inverse – Least Square Approximations.

UNIT II SET THEORY 15

Sets – Basic Definition – Set operations – Laws of Set Theory – Principles of Inclusion and Exclusion – Relations – Properties of Relations – Equivalence Relation – Partitions – Closure Operations on Relations – Functions: Injective – Surjective – Bijective.

UNIT III GRAPH THEORY AND ALGORITHMS 15

Basic Concepts – Isomorphism – Sub Graphs – Multi Graphs – Euler Circuits – Hamiltonian Graphs – Chromatic Numbers. Algorithms: Prim's Algorithm – Kruskal Algorithm – Dijikstra's Algorithm – Shortest Path Algorithm.

UNIT IV NUMBER THEORY 15

Divisibility – GCD – Prime Numbers – Fundamental Theorem of Arithmetic – Congruences – Fermat's Theorem – Euler's Function – Primality Testing – Solution of Congruences – Chinese Remainder Theorem – Wilson's Theorem.

UNIT V MATHEMATICAL TRANSFORMS 15

Laplace Transform: Definition – Results – Properties. Fourier Transform: Fourier Sine and Fourier Cosine Transforms – Properties. Z -Transform: Results and Properties.

L: 45 T: 30 TOTAL: 75 PERIODS

REFERENCES

1. Richard Bronson, "Matrix Operations", Schaum's Outline Series, McGraw-Hill publishers, New York, 1989.
2. A.Tamilarasi, A.M.Natarajan, "Discrete Mathematics and its Application", 3rd Edition, Khanna Publishers, 2005.
3. Dr.M.K.Venkatraman, Dr.N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", 1st Edition, National Publishing Company, Chennai, 2000.
4. Niven, H.S.Zuckerman and Montgomery, "An Introduction to the Theory of Numbers" 3rd Edition, Wiley Publisher, 2006.
5. David M. Burton, "Elementary Number Theory", 6th Edition, Tata McGraw-Hill, 2008.
6. S B Malik, "Basic Number Theory", 2nd Edition, Vikas Publishers, 2007.
7. T.Veerarajan, "Transforms and Partial Differential Equations", McGraw-Hill Publishers, 2012.

15CT12C ADVANCED ALGORITHMS AND ANALYSIS **L T P C**
3 0 0 3

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**

Divide and Conquer: Binary Search – Analysis - Greedy Method: Prim's Algorithm – Analysis - Dynamic Programming strategies: Computing Binomial Co-efficient – Analysis - Backtracking: Eight Queen's Problem- Analysis - Branch and Bound- 0 / 1 Knapsack Problem

UNIT III EFFICIENT DATA PROCESSING **9**

Searching algorithms - Priority queues - Binary heaps - Binomial heaps - Dictionaries - Hash tables - String Matching - Introduction to string-matching problem- Naïve algorithm - Rabin Karp - Knuth Morris Pratt - Boyer-Moore algorithms and complexity analysis- Data compression algorithms - Huffman compression -Lempel-Ziv compression

UNIT IV PROBABILISTIC & PARALLEL ALGORITHMS **9**

Probabilistic Algorithm - Numerical probabilistic algorithms - Monte Carlo algorithms-Las Vegas algorithms - Parallel algorithms: Introduction - Complexity measure for a parallel algorithm- parallel searching algorithm - parallel sorting algorithm - parallel algorithm for matrix manipulation

UNIT V COMPUTATIONAL COMPLEXITY & APPROXIMATION ALGORITHMS **9**

The class P and NP: NP- Completeness Problem, NP-Hard Problems - Approximation Algorithms: Introduction- approximation factor- Polynomial Time Approximation Scheme (PTAS) - Fully Polynomial Time Approximation Scheme (FPTAS) - Approximation algorithms: Travelling Salesman Problem – knapsack problem - Bin packing- subset sum problem

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Dave, Dave Parag Himanshu, "Design and Analysis of Algorithms", 2nd Edition, Pearson Education India, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction To Algorithms ", 3rd Edition, MIT Press, 2008.
3. Sara Baase, "Computer Algorithms: Introduction to Design and Analysis, Second Edition", Addison-Wesley, 2008.
4. Banachowski. L, Kreczmar. A, Wojciech. R, "Analysis of Algorithms and Data Structures", 2nd Edition, Addison Wesley, 2006.
5. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 2nd Edition, Pearson Education, 2011.

15CT13C OPEN SOURCE TECHNOLOGIES

L	T	P	C
3	0	0	3

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 7

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 10

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 10

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 9

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 9

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing “, Oreily Media, 2004.
3. Nicholas Wells, “The Complete Guide to Linux System Administration”, Course Technology Inc, 2005.
4. Steve Suehring, Tim Converse, Joyce Park, “PHP6 and MySQL Bible”, John Wiley & Sons, 2009.
5. Marko Gargenta, Masumi Nakamura, “Learning Android Develop Mobile Apps using Java and Eclipse”, O’Reilly Media, 2014.

15CT14C **ADVANCED DATABASES** **L T P C**
3 0 0 3

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 10

Distributed Database Concepts – Design Issues – Architecture – Fragmentation – Distributed Query Processing – Optimization of Distributed Queries – Distributed Transactions – Concurrency Control – Data Replication.

UNIT II SPATIAL AND TEMPORAL DATABASES 8

Spatial Databases: Introduction – Spatial Representation – Data Types – Relationships – Access Methods – Indexing. Temporal Databases: Motivation – Indexing – Snapshot index. Spatiotemporal databases.

UNIT III MOBILE DATABASES 9

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

UNIT IV MULTIMEDIA DATABASES 9

Multidimensional Databases – Image Databases – Text/Document Databases – Video Database – Audio Databases – Multimedia Database Design.

UNIT V XML DATABASES 9

Introduction – DTD – XSL – XPath – XPointer – XLink – XML Schema – RDF – XQuery –XML and Database – XML in Oracle.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. M.Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, 3rd Edition, Pearson Education, 2011.
2. Philippe Rigaux, Michel O. Scholl and Agnes Voisard, “Spatial Databases: with Applications to GIS”, 2nd Edition, Morgan Kaufmann Publishers, 2002.
3. V. S. Subramanian, “Principles of Multimedia Database Systems”, 2nd Edition, Harcourt India Pvt Ltd., 2004.
4. Vijaykumar,”Mobile Database Systems”, 1st Edition, John Wiley Publication, 2006.
5. Henry F Korth, Abraham Silberschatz and S. Sudharshan, “Database System Concepts”, 6th Edition, McGraw Hill, 2010.
6. Thomas Cannolly, Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, 4th Edition, Pearson Education, 2005.

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**

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless adhoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas- Multiple Channel MAC Protocols – Routing in Ad hoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols.

UNIT II TRANSPORT & QOS IN AD HOC NETWORKS **9**

TCP's challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT III MAC & ROUTING IN WIRELESS SENSOR NETWORKS **9**

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention-Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zig bee – Topology Control – Routing Protocols

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS **9**

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control – In-network processing – Operating systems for wireless sensor networks – Examples

UNIT V SECURITY IN AD HOC AND SENSOR NETWORKS **9**

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Antitamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, "Ad Hoc Mobile Wireless Networks", Auerbach Publications, 2008.
2. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Inc., 2005.
3. Erdal Çayırcı , Chunming Rong, "Security in Wireless Ad Hoc and Sensor Networks", John Wiley and Sons, 2009.
4. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.
5. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition", World Scientific Publishing, 2011.
6. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theory and Practice", John Wiley and Sons, 2010.
7. Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.

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.

P: 60 TOTAL: 60 PERIODS

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

15CT21C BIG DATA ANALYTICS AND MANAGEMENT

L	T	P	C
3	0	0	3

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 **9**

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 **9**

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 **9**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow– Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.

UNIT IV MAP REDUCE APPLICATIONS **9**

MapReduce workflows – Unit Tests with MRUnit – Test Data and Local Tests – Anatomy of MapReduce job run – Failures – Job scheduling – Task execution – MapReduce types – Input formats – Output formats.

UNIT V RELATED TOOLS **9**

Pig: Execution Types – Pig Latin – User Defined Functions – Data processing Operators. Hive – Hive Shell – Services and Meta Store – Comparison with Traditional Data Stores – HiveQL – HiveQL data manipulation – HiveQL queries.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", 1st Edition, Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'Reilley Media Inc, 2012.
4. Chuck Lam, “Hadoop in Action”, 1st Edition, Manning Publications Co, 2011.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", 1st Edition, O'Reilley Media Inc, 2012.
6. Krishtina Chodorow and Michael Dirolf, “MongoDB: The Definitive Guide”, 1st Edition, O'Reilley Media, 2010.

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 – Multimedia data mining – Text mining – Mining the World Wide Web – Tools: Weka Tool and R Tool .

L: 45 T: 30 TOTAL: 75 PERIODS

REFERENCES

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

15CT23C PRINCIPLES OF CLOUD COMPUTING

L	T	P	C
3	0	0	3

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

Vision - Definition – Reference Model - Characteristics and benefits – Historical Development: Distributed Computing - Service Oriented Computing – Web2.0 – Web Services - Grid.

UNIT II VIRTUALIZATION 10

Basics of Virtualization: Characteristics – Taxonomy of Virtualization Techniques – Hardware Level Virtualization – Operating System Level Virtualization – Virtualization and Cloud Computing – Pros and Cons of Virtualization – Case Study: XEN, VMware.

UNIT III CLOUD ARCHITECTURE AND SERVICES 9

Cloud Architecture – Cloud Services: Infrastructure as a Service – Platform as a Service – Software as a Service – Types of Cloud: Private Cloud – Public Cloud – Hybrid Cloud – Community Cloud – Challenges – Cloud Applications.

UNIT IV SECURITY IN THE CLOUD 9

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

UNIT V CLOUD PLATFORMS AND TOOLS 10

Amazon web services: Compute Services – Storage Services – Communication Services – Google AppEngine: Architecture – Application Life Cycle – Cost Model - Microsoft Azure: Core Concepts – SQL Azure - Tool kits: – CloudSim - Eucalyptus.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, “Mastering Cloud Computing Foundations and Applications Programming”, 1st Edition, Morgan Kaufmann imprints in Elsevier, 2013.
2. Kai Hwang, Geoffrey C Fox and Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, 1st Edition, Morgan Kaufmann Publishers, 2012.
3. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, 1st Edition, CRC Press, 2010.
4. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, 1st Edition, O'Reilly Media Inc, 2009.
5. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, “Cloud Computing, A Practical Approach”, 1st Edition, McGraw Hill Osborne Media, 2009.

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 Eular'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 – HMAC. Digital Signatures - Digital Signature Standard - User Authentication Protocols.

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

1. William Stallings, "Cryptography and Network Security - Principles and Practices", 5th Edition, Pearson Education, 2010.
2. Behrouz A. Foruzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.
3. Bruice Schneier, "Applied Cryptography: Protocols, Algorithms and Source Code in C", 2nd Edition, Wiley India (P) Ltd., 2008.
4. Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 4th Edition, Pearson Education, 2011.

15CT25C	RESEARCH PAPER AND PATENT REVIEW – SEMINAR	L	T	P	C
		0	0	4	2

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 atleast 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 HCatolog
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

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 - Generalised Fourier Expansion.

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

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 - Multi-band Wavelet transforms. Lifting Scheme: Wavelet Transform using Polyphase matrix Factorization - Geometrical foundations of lifting scheme - Lifting scheme in Z-domain.

UNIT V WAVELET APPLICATIONS 9

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

L:45 TOTAL: 45 PERIODS

REFERENCES

1. Rao.R.M and A.S.Bopardikar, "Wavelet Transforms: Introduction to theory and Applications", Prentice Hall PTR, 1st Edition**,** 1998.
2. K.P.Soman and K.I.Ramachandran, "Insight into Wavelets - From Theory to practice", PHI Learning Private Limited, 3rd Edition, 2013.
3. Strang G and Nguyen T, "Wavelets and Filter Banks", Wellesley College,2nd Edition, 1996
4. Vetterli M, Kovacevic J, "Wavelets and Sub-band Coding", Create Space Independent Publishing Platform, 1st Edition, 2013.
5. Mallat S, "A Wavelet Tour of Signal Processing", Academic Press, 3rd Edition, 2008.

15CT02E DISTRIBUTED COMPUTING

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 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 – Reliable Group Communication – Distributed Commit Protocols – Failure – Recovery.

UNIT V DISTRIBUTED OBJECT BASED SYSTEM 8

Distributed Object Based System: Architecture – Communication – Naming – CORBA – Distributed Coordination Based System – Coordination model – Architecture – Content based routing – Synchronization.

L: 45 TOTAL: 45 PERIODS

REFERENCES

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

15CT03E **PERVASIVE COMPUTING** **L T P C**
3 0 0 3

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 9

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 9

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

UNIT III SPEECH APPLICATIONS 9

Voice Enabling Pervasive Computing – Voice Standards – Speech Applications in Pervasive Computing and security.

UNIT IV PDA AND PERVASIVE COMPUTING 9

PDA in Pervasive Computing – Introduction – PDA software Components – Standards – emerging trends – PDA Device characteristics – PDA Based Access Architecture.

UNIT V ADVANCED CONCEPTS 9

User Interface Issues in Pervasive Computing – Architecture – Smart Card based Authentication Mechanisms – Wearable computing Architecture.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec and Klaus Rindtorff, “Pervasive Computing: Technology and Architecture of Mobile Internet Applications”, 3rd Edition, Addison-Wesley Professional, 2007.
2. Uwe Hansman, Lothat Merk, Martin S Nicklous and Thomas Stober, “Principles of Mobile Computing”, 2nd Edition, Springer - Verlag, New Delhi, 2003.
3. Rahul Banerjee, “Internetworking Technologies: An Engineering Perspective”, 2nd Edition, Prentice Hall of India, 2004.
4. Rahul Banerjee, “Lecture Notes in Pervasive Computing”, Outline Notes, BITS-Pilani, 2003.
5. Jochen Burkhardt, Dr. Horst Henn, Stefan Hepper and Klaus Rintdorff, Thomas Schaeck, “Pervasive Computing”, 2nd Edition, Addison Wesley, 2009.
6. F.Adelstein, S.K.S. Gupta, “Fundamentals of Mobile and Pervasive Computing”, 1st Edition, Tata McGraw Hill, 2005.

15CT04E DIGITAL IMAGE PROCESSING

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 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

Multi Resolution Analysis : Image Pyramids – Multi resolution expansion – Wavelet Transforms. Image Compression : Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

UNIT V REGISTRATION AND IMAGE FUSION 9

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-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.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2009.
2. John C. Russ, “The Image Processing Handbook”, 6th Edition, CRC Press, 2011.
   S.Jayaraman, S.Esakkirajan, T.Veerakumar, “Digital Image Processing”, 1st Edition, Tata Mc Graw Hill, 2009.
3. Rafael C.Gonzalez, Richard E.Woods and Steven L.Addins, “Digital Image Processing Using MATLAB”, 2nd Edition, Pearson Education, 2009.
4. Ardeshir Goshtasby, “2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications”, John Wiley and Sons,2005.

15CT05E	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

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 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 LANGUAGE 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 LANGUAGE 9

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

UNIT V UNDECIDABILITY 9

Non Recursive Enumerable Language – Recursive Enumerable Language – Undecidable Problems about TM – Post's Correspondence Problem – The Class P and NP.

L: 45 TOTAL: 45 PERIODS

REFERENCES

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

15CT06E SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

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 9

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

UNIT II FORMAT PROCESS MODELS AND THEIR USE 9

Definition and Format Model for a Process – ISO 9001 and CMM Models and their relevance to Project Management – Other Emerging Models like People CMM.

UNIT III UMBRELLA ACTIVITIES IN PROJECTS 9

Metrics – Methods and Tools for Metrics – Issues of Metrics in multiple Projects – Configuration Management – Software Quality Assurance – Quality Standards and Certifications - Process and Issues in obtaining Certifications - Risk issues in Software Development and Implementation – Identification of Risks – Resolving and Avoiding risks – Tools and Methods for Identifying Risk Management.

UNIT IV INSTREAM ACTIVITIES IN PROJECTS 9

Project Initiation – Project Planning – Execution and Tracking – Project Wind up – Concept of Process - Project Database.

UNIT V ENGINEERING AND ISSUES IN PROJECT MANAGEMENT 9

Phases: Requirements, Design, Development, Testing, Maintenance, Deployment – Engineering Activities and Management Issues in Each Phase – Special Considerations in Project Management for India and Geographical Distribution Issues.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Bob Hughes and Mike Cotterell, “Software Project Management”, 5th Edition, Tata McGraw Hill, 2011.
2. Kelker, S. A, “Software Project Management”, 2nd Edition, Prentice Hall, 2003.
3. Royce and Walker, “Software Project Management”, 2nd Edition, Pearson Education, 2002.
4. Gopalaswamy Ramesh, "Managing Global Projects", 1st Reprint Edition, Tata McGraw Hill, 2006.
5. Robert K. Wysocki, “Executive's Guide to Project Management”, 2nd Edition, John Wiley & Sons, 2011.
6. Teresa and luckey, Joseph Phillips, “Software project Management for dummies”, 3rd Edition, Wiley publishing Inc., 2006.

15CT07E NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

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 9

Overview: Origins and challenges of NLP - Language and Grammar - Processing Indian Languages - NLP Applications: Machine Translation - Information Extraction. Language Modeling: Introduction -Various Grammar - Based Language Models - Statistical Language Model

UNIT II PART-OF-SPEECH TAGGING AND CONTEXT-FREE GRAMMARS 9

English Word classes - Tagsets for English - Part-of Speech Tagging - Rule based Part-of-Speech Tagging - Stochastic Part-of-Speech Tagging - Transformation-Based Tagging. Stemming - Context-Free Grammars for English: Constituency - Context Free Rules and Trees - Sentence Level Constructions - The Noun Phrase - Coordination - Agreement - The Verb Phase and Sub categorization - Auxiliaries - Spoken Language Syntax - Grammars Equivalence and Normal Form - Finite-State and Context -Free Grammars - Grammars and Human Processing.

UNIT III PARSING AND ADVANCED FEATURES 9

Parsing as Search - A Basic Top-Down Parser - Problems with the Basic Top-Down Parser - The Early Algorithm - Finite-State Parsing Methods. Features and Unification: Feature Structures - Unification of Feature Structures - Features Structures in the Grammar - Implementing Unification - Parsing with Unification Constraints - Types and Inheritance.

UNIT IV SEMANTICS ANALYSIS AND LEXICAL SEMANTICS 9

Semantic Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Semantic Analysis: Syntax-Driven Semantic Analysis - Attachments for a Fragment of English - Integrating Semantic Analysis into the Early Parser - Idioms and Compositionality - Robust Semantic Analysis - Lexical Semantics: Relational among Lexemes and their Senses - Word Net: A database of Lexical Relations - The Internal Structure of Words.

UNIT V EVALUATION METRICS AND MEASURES 9

Manual Evaluation - Fluency and Adequacy - Other Evaluation Criteria - Automatic Evaluation - Precision and Recall - F-Measure - Word Error Rate - Bilingual Evaluation Understudy – METEOR - Multiple Reference Translations - Pearson's Correlation Coefficient - Hypothesis Testing - Pair wise comparison - Task oriented Evaluation.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, 3rd Edition, Oxford University Press, 2008.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall, 2008.
3. James Allen, “Natural Language Understanding”, 2nd Edition, Benjamin-Cummings Publishing Co., 1995
4. Christopher D.Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing “, 1st Edition, MIT Press, 1999.
5. Philipp Koehn “Statistical Machine Translation”, 1st Edition, Cambridge University Press, January 2010.

15CT08E **SOFT COMPUTING** **L T P C**
3 0 0 3

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

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems –Fuzzy Decision Making - Fuzzy Tool box in Matlab.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks –Unsupervised Learning Neural Networks – NNTool in Matlab.

UNIT III NEURO - FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – ANFIS Applications using Matlab.

UNIT IV GENETIC ALGORITHMS 9

Evolutionary Computation – Genetic Algorithms – Terminologies and Operators of GA –Ant Colony Optimization – Particle Swarm Optimization – GATool using Matlab.

UNIT V APPLICATIONS 9

Fuzzy Classification – Fuzzy Pattern Recognition – Applications of Neural Networks: Bio informatics, Knowledge Extraction, Security Systems, Natural Landmark Recognition Task - Applications of Genetic Algorithm: Machine Learning, Image Processing, Data Mining and Wireless Networks.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, 3rd Edition, Wiley, 2010.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, 1st Edition, Prentice-Hall of India, 2003.
3. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, 1st edition, Springer, 2007.
4. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, 1st Edition, Springer, 2007.
5. Simon Haykin, “Neural Networks and Learning Machines”, 3rd Edition, Pearson Education, 2008.

15CT09E INTERNET PROGRAMMING

L	T	P	C
3	0	0	3

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**

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

UNIT II DYNAMIC HTML **9**

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

UNIT III SCRIPTS AND APPLETS **9**

JavaScript: Introduction – Control Structures – Functions – Arrays – Objects – Simple Web Applications – Applets – Life Cycle – Events – Layouts.

UNIT IV SERVLETS **9**

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

UNIT V ASP AND JSP **9**

ASP Basics – ASP Objects – ASP applications. JSP: JSP Basic Programming – JSP objects – Applications – PHP – MySQL.

L: 45 TOTAL:45 PERIODS

REFERENCES

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

15CT10E PATTERN RECOGNITION

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 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 8

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

UNIT II STATISTICAL PATTERN RECOGNITION 7

Statistical Patten Recognition: Bayesian Decision Theory – Classifiers – Normal density and discriminant functions.

UNIT III MODELS 10

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

UNIT IV NON PARAMETRIC TECHNIQUES 10

Nonparametric Techniques: Density Estimation – Parzen Windows – K-Nearest Neighbor Estimation – Nearest Neighbor Rule – Fuzzy classification.

UNIT V CLUSTERING TECHNIQUES 10

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

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

15CT11E MOBILE COMPUTING

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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 9

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

UNIT II TELECOMMUNICATION SYSTEMS 9

GSM – System Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Handover – Security – General packet radio service.

UNIT III WIRELESS NETWORKS 9

Wireless LAN – IEEE 802.11 Standards – Architecture – Services – High Performance Radio LAN – Adhoc Network – Blue Tooth - Zig bee.

UNIT IV NETWORK LAYER 9

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

UNIT V TRANSPORT AND APPLICATION LAYERS 9

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Jochen Schiller, “Mobile Communications”, 3rd Edition, Pearson Education, 2005.
2. William Stallings, “Wireless Communications and Networks”, 2nd Edition, Pearson Education, 2004.
3. Asoke k Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile computing”, 2nd Edition, Tata McGraw Hill, 2010.
4. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, 1st Edition, Pearson Education, 2003.
5. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, 2nd Edition, Springer, 2003.

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 9

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

UNIT II XML TECHNOLOGY 9

XML – XML Schemas – Validating XML documents using XML Schema – Name Spaces – Structuring with Schemas – Presentation Techniques – Transformation Techniques.

UNIT III WEB SERVICES 9

Overview – Architecture – Key Technologies – UDDI Data Structure – Business Entity – Business Service – WSDL – Types, Messages, Ports, Bindings, Services.

UNIT IV SOAP 9

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

UNIT V XML SECURITY 9

Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines for Signing XML Documents – XML in Practice.

L: 45 TOTAL: 45 PERIODS

REFERENCES

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

15CT13E SOFTWARE QUALITY ASSURANCE L T P C
3 0 0 3

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 9

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

UNIT II SOFTWARE TESTING 9

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

UNIT III SOFTWARE TESTING TYPES 9

Testing strategies – Structured approach to testing – Test factors – White box and Black box approach – unctional and structural testing – Workbench concept – Testing methodologies– Testing tactics checklist Integration testing – System and acceptance testing – Performance testing – Regression testing – nternationalization testing – Adhoc testing – Website testing – Usability testing – Accessibility testing – Test plan – Management – Execution and reporting – Software test automation – Automated testing tools.

UNIT IV IMPLEMENTATION AND VALIDATION OF SOFTWARE QUALITY METRICS 9

Hierarchical models of software quality – software quality metrics – Product quality metrics 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 9

Project progress control – Costs – Quality management standards – Project process standards – Management and its role in SQA – SQA unit.

L: 45 TOTAL: 45 PERIODS

REFERENCES

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

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

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

UNIT II ONTOLOGY LANGUAGES 9

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

UNIT III ONTOLOGY CONSTRUCTION 9

Ontology Engineering – Constructing Ontology – Ontology Methods – Ontology Sharing and Merging – Ontology Libraries and Ontology Mapping – Logic, Rule and Inference Engines.

UNIT IV ONTOLOGY DEVELOPMENT TOOLS 9

Ontology Development using Protege Editor – Ontology Querying – Ontology Reasoning and Description Logic (DL) – Semantic Web Application Areas – Ontology Programming with Jena API.

UNIT V SEMANTIC WEB APPLICATIONS 9

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Berners Lee, Gödel and Turing "Thinking on the Web", 2nd Edition, Wiley Inter science, 2008.
2. Peter Mika, "Social Networks and the Semantic Web", 1st Edition, Springer Publications, 2007.
3. John Davies, Rudi Studer, Paul Warren, "Semantic Web Technologies, Trends and Research in Ontology Based Systems", 1st Edition, John Wiley & Sons, 2006.
4. John Hebeler, Matthew Fisher , Ryan Blace and Andrew Perez-Lopez, "Semantic Web Programming", 1st Edition, Wiley Publications, 2009.
5. Heiner Stuckenschmidt; Frank Van Harmelen, "Information sharing on the semantic Web", 1st Edition, Springer, 2005.
6. T.Segaran, C.Evans and J.Taylor, "Programming the Semantic Web", 1st Edition, O'Reilly Publishers, 2009.

15CT15E INFORMATION RETRIEVAL TECHNIQUES

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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 **9**

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

UNIT II QUERYING **9**

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

UNIT III TEXT OPERATIONS AND USER INTERFACE **9**

Document preprocessing – Clustering – Text compression – Indexing and searching – Inverted files – Sequential searching – Pattern matching – User interface and Visualization – Human Computer Interaction – Access process – Starting points – Query specification – User relevance judgment – Interface for search.

UNIT IV MULTIMEDIA INFORMATION RETRIEVAL **9**

Data models – Query languages – Spatial access models – Generic approach – One dimensional time series – Two dimensional color images – Feature extraction.

UNIT V BIG DATA ANALYTICS AND APPLICATIONS OF IR **9**

Introduction to Big Data Analytics – Big Data Applications – Challenges in Unstructured data processing – Tools – Applications: Search engines – Digital libraries – Online public access catalogs.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, “Modern Information Retrieval”, 2nd Edition, Pearson Education Asia, 2005.
2. G.G. Chowdhury, “Introduction to Modern Information Retrieval”, 3rd Edition, Facet Publishing, 2010.
3. Rajendra Akerkar, “Big Data Computing”, 1st Edition, Taylor & Francis Group, 2013.
4. David A. Grossman, Ophir Frieder, “Information Retrieval: Algorithms, and Heuristics”, 2nd Edition, Springer, 2004.
5. Charles T. Meadow, Bert R. Boyce, Donald H. Kraft and Carol L. Barry, “Text Information Retrieval Systems”, 3rd Edition, Academic Press, 2003.
6. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, “An Introduction to Information Retrieval”, 1st Edition, Cambridge University Press, 2008.

15CT16E DATA VISUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

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 Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation , Hardware and Applications .

L: 45 TOTAL : 45 PERIODS

REFERENCES

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.
3. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2 nd Edition, 2007.
4. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

15CT17E NETWORK CONGESTION CONTROL AVOIDANCE TECHNIQUES

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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 **9**

Internet Congestion Collapse - Resource Management Solution – Van Jacobson Congestion Control – Elements of Congestion Control – TCP Variants – Karns algorithm – Issues in TCP - TCP Congestion Control Concepts.

UNIT II CONGESTION CONTROL IN NETWORK LAYER **9**

Network Congestion – Routing algorithm – Packet queuing and service policy – Congestion Control Methods – Choke Packets – Multiprotocol routers – QoS – Concatenated virtual circuits – Tunneling – Packet Fragmentation.

UNIT III CONGESTION CONTROL IN FRAME RELAY **9**

Frame Relay Congestion Technique – Discard control – FECN – BECN – Frame Relay Traffic Shaping – Implicit Congestion Control – QoS in Frame relay – Frame Relay Virtual Circuits – FRAD techniques.

UNIT IV CONGESTION AVOIDANCE FLOW CONTROL **9**

End to end flow control in TCP – Slow Start – Fast retransmit, Fast Recovery – Additive Increase / Multiplicative Decrease.

UNIT V CONGESTION AVOIDANCE MECHANISM **9**

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Michael Welzl, **"**Network Congestion Control: Managing Internet Traffic", John Wiley & Sons, May 2005.
2. Pete Loshin, "TCP/IP Clearly explained", 4th Edition, Morgan Kauffmann Series in Networking, 2003.
3. Martin P.Clark , "Data Networks, IP and the Internet", John Wiley & Sons, 2003.
4. R. Srikant, "The Mathematics of Internet Congestion Control", Springer Publications, 2004.
5. Michael Welzl**,** "Scalable Performance Signalling and Congestion Avoidance", Kluwer Academic Publishers, 2003.

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

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

UNIT II PKI ALGORITHMS 8

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

UNIT III DESIGN, IMPLEMENTATION AND MANAGEMENT 10

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

UNIT IV E-COMMERCE SECURITY THREATS 9

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

UNIT V APPLICATIONS OF PKI 8

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

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Larry Caffrey, Rogers W'o Okot-Uma, "Trusted Services and Public Key Infrastructure", 1st Edition, Common Wealth Secretariat Publishers, 2001.
2. Cartisle Adams, Steve Lloyd, "Understanding PKI: Concepts, Standards and Deployment Considerations", 2nd Edition, Pearson Education, 2003.
3. Vacca R Vacca, "Public Key Infrastructure: Building Trusted Applications and Web Services", 1st Edition, CRC Press LLC 2004.
4. Andrew Nash, William Daune, Celia Joseph and Derek Brink, "PKI – Implementing and Managing E-Security", 2nd Edition, Tata McGraw-Hill Edition, 2001.
5. Gray P.Schneider, "Electronic Commerce", 4th Annual Edition, 2003.
6. Roberta Bragg, mark Phodes-Ousley and Keith Strassberg, "The Complete Reference Network Security", 1st Edition, Tata McGraw-Hill Edition, 2004.

15CT19E SPEECH AND LANGUAGE TECHNOLOGY

L	T	P	C
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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

1. Dr.Shaila D.Apte, “Speech and Audio Processing”, 1st Edition, Wiley Publishers, 2012.
2. Daniel Jurafsky, James H.Martin, “Speech and Language Processing”, 2nd Edition, Pearson Education, 2011.
3. Ben Gold and Nelson Morgan, “Speech and Audio Signal Processing”, 1st Edition, John Wiley publications, 2007.
4. Sadaoki Furui, “Digital Speech Processing, Synthesis and Recognition”, 2nd Edition, Mercel Dekkar Inc, New York and Basel, 1989.
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, Pages:1-8, 2010.
6. Yang Liu and Elizabeth Shriberg, “Comparison of Evaluation Metrics For Sentence Boundary Detection”, 2010.

15CT20E	MEDICAL IMAGE PROCESSING (Common to CS and CSE)	L	T	P	C
		3	0	0	3

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 9

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 9

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 9

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 9

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 9

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

1. Atam P.Dhawan, “Medical Image Analysis”, Wiley Interscience Publication, NJ, USA 2003.
2. Paul Suetens, "Fundamentals of Medical Imaging", 2nd Edition, Cambridge University Press, 2009.
3. J. Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging, Medical Image Processing and Analysis", SPIE Publications, Volume 2, 2009.
4. Kayvan Najarian and Robert Splinter, "Biomedical Signal and Image Processing", 2nd Edition, CRC Press, 2005.
5. Geoff Dougherty, "Digital Image Processing for Medical Applications", 1st Edition,Cambridge University Press, 2009.
6. Jerry L. Prince and Jonathan Links, "Medical Imaging Signals and Systems", 1st Edition, Prentice Hall, 2005.
7. John L. Semmlow, "Biosignal and Medical Image Processing", 2nd Edition, CRC Press, 2008.

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

Introduction to Machine Learning - Types of Machine learning - Basic Concepts in Machine Learning - Examples of Machine Learning Applications - Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison.

UNIT II SUPERVISED LEARNING 9

Linear Models for Classification: Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks: Feed-forward Network Functions - Error Backpropagation – Regularization in Neural Networks - Mixture Density Networks - Bayesian Neural Networks. Kernel Methods - Dual Representations - Radial Basis Function Networks - Ensemble learning: Boosting - Bagging.

UNIT III UNSUPERVISED LEARNING 9

Clustering - K-means - Mixtures of Gaussians - The EM Algorithm in General – Model Selection for Latent Variable Models - High-Dimensional Spaces. Dimensionality Reduction: Factor analysis - Principal Component Analysis - Probabilistic PCA - Independent components analysis.

UNIT IV PROBABILISTIC GRAPHICAL MODELS 9

Directed Graphical Models: Introduction - Bayesian Networks - Examples – Naive Bayes classifiers - Markov Models – Hidden Markov Models – Inference – Learning - Conditional independence properties of DGMs. Undirected graphical models: Markov random fields - Conditional independence properties - Parameterization of MRFs – Examples of MRF - Learning - Conditional random fields (CRFs) - Structural SVMs.

UNIT V ADVANCED LEARNING 9

Sampling – Basic Sampling Methods – Monte Carlo. Reinforcement Learning: K-Armed Bandit - Elements of Reinforcement Learning - Model-Based Learning. Temporal Difference Learning - Exploration Strategies - Deterministic and Non-deterministic Rewards and Actions - Eligibility Traces – Generalization - Partially Observable States - The Setting - Example. Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning - accuracy and confidence boosting.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Edition, Prentice Hall of India, 2010.
4. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, CRC Press, 2011.
5. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
6. Hastie, Tibshirani, Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer, 2008.

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

The Cognitive view –Some Fundamental Concepts – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge representation -The Nature of Artificial Intelligence - Knowledge Representation – Artificial Intelligence: Search, Control, and Learning

UNIT II COGNITIVE PSYCHOLOGY 10

Cognitive Psychology – The Architecture of the Mind - The Nature of Cognitive Psychology- A Global View of The Cognitive Architecture- Propositional Representation- Schematic Representation-Cognitive Processes, Working Memory, and Attention- The Acquisition of Skill- The Connectionist Approach to Cognitive Architecture

UNIT III COGNITIVE NEUROSCIENCE 8

Brain and Cognition: Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology- Computational Neuroscience - The Organization of the mind - Organization of Cognitive systems - Strategies for Brain mapping – A Case study: Exploring mindreading.

UNIT IV LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODE 10

Language Acquisition: Milestones in Acquisition – Theoretical Perspectives- Semantics and Cognitive Science – Meaning and Entailment – Reference – Sense – Cognitive and Computational Models of Semantic Processing – Information Processing Models of the Mind- Physical symbol systems and language of thought- Applying the Symbolic Paradigm- Neural networks and distributed information processing- Neural network models of Cognitive Processes

UNIT V HIGHER-LEVEL COGNITION 8

Reasoning – Decision Making – Computer Science and AI: Foundations & Robotics – New Horizons -Dynamical systems and situated cognition- Challenges – Emotions and Consciousness – Physical and Social Environments – Applications

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, “Cognitive Science: An Introduction”, 2nd Edition, 1995.
2. José Luis Bermúdez, “Cognitive Science: An Introduction to the Science of the Mind”, Cambridge University Press, New York, 2010.
3. Robert L. Solso, Otto H. MacLin and M. Kimberly MacLin, “Cognitive Psychology”, Pearson Education, 2007,
4. J. Friedenberg and G. Silverman, “Cognitive Science: An Introduction to the Study of Mind”, 2006.
5. Steven Pinker, “How the mind works”, 2009.
6. Carolyn Panzer Sobel and Paul Li, “Cognitive Science: An Interdisciplinary Approach”, 2013.
7. Paul Thagard, “Mind: Introduction to Cognitive Science”, 2nd Edition, MIT Press, 2005.

15CT23E	GREEN COMPUTING	L	T	P	C
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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 9

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING 9

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 9

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 9

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 9

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

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011.
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, 1st Edition, Wiley, 2009.
3. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
4. John Lamb, “The Greening of IT”, 1st Edition, Pearson Education, 2009.
5. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
6. Wu Chun Feng, “Green computing: Large Scale energy efficiency”, CRC Press, 2012.

15CT24E FUZZY LOGIC THEORY AND ITS APPLICATIONS

L	T	P	C
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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**

Classical Sets - Operations on Classical Sets - Properties of Classical (Crisp)- Mapping of Classical Sets to functions Fuzzy Sets-Fuzzy Set Operations -Properties of Fuzzy Sets - Alternative Fuzzy Set Operations

UNIT II CLASSICAL RELATIONS AND FUZZY RELATIONS **9**

Cartesian product -Crisp Relations -Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition. Tolerance and Equivalence Relations Crisp Equivalence Relation - Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations, Value Assignments

UNIT III MEMBERSHIP FUNCTIONS AND FUZZIFICATION **9**

Features of the Membership Function -Various Forms -Fuzzification -Defuzzification to Crisp Sets -λ-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**

Feature Analysis -Partitions of the Feature Space -Single-Sample Identification -Multifeature Pattern Recognition - Fuzzy Optimization -One-Dimensional Optimization -Fuzzy Cognitive Mapping -Concept Variables and Causal Relations -Fuzzy Cognitive Maps -Agent-Based Models

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Timothy J. Ross, “Fuzzy logic with Engineering Applications”, 3rd Edition, Wiley, 2010.
2. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, 1st Edition, Springer, 2007.
3. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, 1st Edition, Prentice-Hall of India, 2003.