AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

REGULATIONS – 2013

M.E. BIOMETRICS AND CYBER SECURITY

I TO IV SEMESTERS CURRICULA AND SYLLABI (FULL TIME)

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA7155	Applied Probability and Statistics	3	1	0	4
2.	CP7101	Design and Management of Computer Networks	3	0	0	3
3.	CP7102	Advanced Data Structures and Algorithms	3	0	0	3
4.	BC7101	Biometric Systems	3	0	0	3
5.	BC7102	Database Design and Security	3	0	0	3
6.		Elective I	3	0	0	3
PRACTICAL						
7.	BC7111	Advanced Data Structures Laboratory	0	0	4	2
8.	BC7112	Technical Seminar	0	0	2	1
		TOTAL	**18**	**1**	**6**	**22**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	NE7202	Network and Information Security	3	0	0	3
2.	BC7201	Biometric Image Processing	3	0	0	3
3.	BC7202	Intrusion Detection and Prevention Systems	3	0	0	3
4.	BC7203	Cyber Security	3	0	0	3
5.		Elective II	3	0	0	3
6.		Elective III	3	0	0	3
PRACTICAL						
7.	BC7211	Cyber Security Laboratory	0	0	3	2
8.	BC7212	Biometric Image Processing Laboratory	0	0	3	2
		TOTAL	**18**	**0**	**6**	**22**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BC7301	Ethical Hacking and Network Defense	3	0	0	3
2.		Elective IV	3	0	0	3
3.		Elective V	3	0	0	3
PRACTICAL						
4.	BC7311	Project Work Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	BC7411	Project Work Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL NO.OF CREDITS:71

LIST OF ELECTIVES

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	BC7001	Multicore Architectures and Security Analysis	3	0	0	3
2.	BC7002	Software Engineering	3	0	0	3
3.	BC7003	Applied Cryptography	3	0	0	3
4.	SE7003	Machine Learning	3	0	0	3
5.	CP7025	Data Mining Techniques	3	0	0	3

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1.	NE7003	Web Engineering	3	0	0	3
2.	BC7004	Access Control and Identity Management System	3	0	0	3
3.	EL7001	Artificial Intelligence	3	0	0	3
4.	BC7005	Operating Systems Security	3	0	0	3
5.	BC7006	Trust Management in E - Commerce	3	0	0	3
6.	BC7007	Biometric Security	3	0	0	3
7.	BC7008	Distributed System Security	3	0	0	3
8.	NE7002	Mobile and Pervasive Computing	3	0	0	3

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CU7001	Real Time Embedded Systems	3	0	0	3
2.	NE7201	Network Programming	3	0	0	3
3.	NE7012	Social Networks Analysis	3	0	0	3
4.	CP7022	Software Design	3	0	0	3
5.	BC7009	Steganography and Digital Watermarking	3	0	0	3
6.	BC7010	Security Threats	3	0	0	3
7.	CP7019	Managing Big Data	3	0	0	3
8.	NE7011	Mobile Application Development	3	0	0	3
9.	BC7011	Wireless Security	3	0	0	3
10.	IF7202	Cloud Computing	3	0	0	3
11.	BC7012	Cybercrime Investigations and Digital Forensics	3	0	0	3

MA7155   **APPLIED PROBABILITY AND STATISTICS**   **L T P C**
                                                                    3 1 0 4

OBJECTIVES:
- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis.

UNIT I   ONE DIMENSIONAL RANDOM VARIABLES   9+3
Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of a Random Variable.

UNIT II   TWO DIMENSIONAL RANDOM VARIABLES   9+3
Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III   ESTIMATION THEORY   9+3
Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.

UNIT IV   TESTING OF HYPOTHESES   9+3
Sampling distributions - Type I and Type II errors - Tests based on Normal, t,2 and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V   MULTIVARIATE ANALYSIS   9+3
Random Vectors and Matrices - Mean vectors and Covariance matrices - Multivariate Normal density and its properties - Principal components Population   principal components - Principal components from standardized variables.

                                        TOTAL 45+15:60 PERIODS
OUTCOME:
- The student will able to acquire the basic concepts of Probability and Statistical techniques for solving mathematical problems which will be useful in solving Engineering problems

REFERENCES:
1 Jay L. Devore, "Probability and Statistics For Engineering and the Sciences", Thomson and Duxbury, 2002.
2. Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice   – Hall , Seventh Edition, 2007.
3. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Asia, Fifth Edition, 2002.
4. Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan an Sons, 2001.
5. Dallas E Johnson , "Applied Multivariate Methods for Data Analysis", Thomson an Duxbury press,1998.

CP7101   **DESIGN AND MANAGEMENT OF COMPUTER NETWORKS**   **L T P C**
                                                                          3 0 0 3

UNIT I   INTRODUCTION TO NETWORK MANAGEMENT   9

Overview of Analysis, Architecture and Design Process-System Methodology, Service methodology, Service Description - Service characteristics - Performance Characteristics - Network supportability - Requirement analysis – User Requirements – Application Requirements – Device Requirements – Network Requirements – Other Requirements - Requirement specification and map.

UNIT II   REQUIREMENTS ANALYSIS   9

Requirement Analysis Process – Gathering and Listing Requirements- Developing service metrics – Characterizing behavior – Developing RMA requirements – Developing delay Requirements - Developing capacity Requirements - Developing supplemental performance Requirements – Requirements mapping – Developing the requirements specification

UNIT III   FLOW ANALYSIS   9

Individual and Composite Flows – Critical Flows - Identifying and developing flows – Data sources and sinks – Flow models- Flow prioritization – Flow specification algorithms – Example Applications of Flow Analysis

UNIT IV   NETWORK ARCHITECTURE   9

Architecture and design – Component Architectures – Reference Architecture – Architecture Models – System and Network Architecture – Addressing and Routing Architecture – Addressing and Routing Fundamentals – Addressing Mechanisms – Addressing Strategies – Routing Strategies – Network Management Architecture – Network Management Mechanisms Performance Architecture – Performance Mechanisms – Security and Privacy Architecture – Planning security and privacy Mechanisms

UNIT V   NETWORK DESIGN   9

Design Concepts – Design Process - Network Layout – Design Traceability – Design Metrics – Logical Network Design – Topology Design – Bridging, Switching and Routing Protocols- Physical Network Design – Selecting Technologies and Devices for Campus and Enterprise Networks – Optimizing Network Design

TOTAL: 45 PERIODS

REFERENCES:

1. Network Analysis, Architecture, and Design By James D. McCabe, Morgan Kaufmann, Third Edition, 2007.ISBN-13: 978-0123704801
2. Computer Networks: A Systems Approach by Larry L. Peterson, Bruce S. Davie - 2007, Elsevier Inc.
3. Top-down Network Design: [a Systems Analysis Approach to Enterprise Network Design] By Priscilla Oppenheimer, Cisco Press , 3rd Edition, ISBN-13: 978-1-58720- 283-4 ISBN-10: 1-58720-283-2
4. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-Gerd Hegering, Sebastian Abeck, and Bernhard Neumair, 1999.
5. "Network Design and Management" – by Steven T.Karris, Orchard publications, Second edition, Copyright 2009, ISBN 978-1-934404-15-7
6. "Network Design, Management and Technical Perspective", Teresa C. Mann-Rubinson and Kornel Terplan, CRC Press, 1999
7. "Ethernet Networks-Design, Implementation, Operation and Management by Gilbert Held, John Wiley and sons, Fourth Edition
8. James Kurose and Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 1999

CP7102　　　　　**ADVANCED DATA STRUCTURES AND ALGORITHMS**　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 0 0 3

OBJECTIVES:
- To understand the principles of iterative and recursive algorithms.
- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.
- To learn the principles of shared and concurrent objects.
- To learn concurrent data structures.

UNIT I　　　**ITERATIVE AND RECURSIVE ALGORITHMS**　　　　　　　　　**9**
Iterative Algorithms: Measures of Progress and Loop Invariants-Paradigm Shift: Sequence of Actions versus Sequence of Assertions- Steps to Develop an Iterative Algorithm-Different Types of Iterative Algorithms--Typical Errors-Recursion-Forward versus Backward- Towers of Hanoi-Checklist for Recursive Algorithms-The Stack Frame-Proving Correctness with Strong Induction-Examples of Recursive Algorithms-Sorting and Selecting Algorithms-Operations on Integers-Ackermann's Function- Recursion on Trees-Tree Traversals- Examples- Generalizing the Problem - Heap Sort and Priority Queues-Representing Expressions.

UNIT II　　　**OPTIMISATION ALGORITHMS**　　　　　　　　　　　　　　　**9**
Optimization Problems-Graph Search Algorithms-Generic Search-Breadth-First Search-Dijkstra's Shortest-Weighted-Path -Depth-First Search-Recursive Depth-First Search-Linear Ordering of a Partial Order- Network Flows and Linear Programming-Hill Climbing-Primal Dual Hill Climbing-Steepest Ascent Hill Climbing-Linear Programming-Recursive Backtracking-Developing Recursive Backtracking Algorithm- Pruning Branches-Satisfiability

UNIT III　　　**DYNAMIC PROGRAMMING ALGORITHMS**　　　　　　　　　**9**
Developing a Dynamic Programming Algorithm-Subtle Points- Question for the Little Bird-Subinstances and Subsolutions-Set of Substances-Decreasing Time and Space-Number of Solutions-Code. Reductions and NP - Completeness **–** Satisfiability - Proving NP-Completeness- 3-Coloring- Bipartite Matching. Randomized Algorithms **-** Randomness to Hide Worst Cases-Optimization Problems with a Random Structure.

UNIT IV　　　**SHARED OBJECTS AND CONCURRENT OBJECTS**　　　　　**9**
Shared Objects and Synchronization -Properties of Mutual Exclusion-The Mora l- The Producer–Consumer Problem -The Readers–Writers Problem-Realities of Parallelization-Parallel Programming- Principles- Mutual Exclusion-Time- Critical Sections--Thread Solutions-The Filter Lock-Fairness - Lamport's Bakery Algorithm-Bounded Timestamps-Lower Bounds on the Number of Locations-Concurrent Objects- Concurrency and Correctness-Sequential Objects-Quiescent Consistency- Sequential Consistency-Linearizability- Formal Definitions- Progress Conditions- The Java Memory Model

UNIT V　　　**CONCURRENT DATA STRUCTURES**　　　　　　　　　　　　**9**
Practice-Linked Lists-The Role of Locking-List-Based Sets-Concurrent Reasoning- Coarse-Grained Synchronization-Fine-Grained Synchronization-Optimistic Synchronization- Lazy Synchronization-Non-Blocking Synchronization-Concurrent Queues and the ABA Problem-Queues-A Bounded Partial Queue-An Unbounded Total Queue-An Unbounded Lock-Free Queue-Memory Reclamation and the ABA Problem- Dual Data Structures- Concurrent Stacks and Elimination- An Unbounded Lock-Free Stack- Elimination-The Elimination Backoff Stack.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Design and apply iterative and recursive algorithms.
- Design and implement optimisation algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.
- Implement and apply concurrent linked lists, stacks, and queues.

REFERENCES:
1. Jeff Edmonds, "How to Think about Algorithms", Cambridge University Press, 2008.
2. M. Herlihy and N. Shavit, "The Art of Multiprocessor Programming", Morgan Kaufmann, 2008.
3. Steven S. Skiena, "The Algorithm Design Manual", Springer, 2008.
4. Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.
5. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms" , McGraw Hill, 2008.
6. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2006.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.
8. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, 1995.
9. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addison-Wesley, 1975.
10. A. V. Aho, J. E. Hopcroft, and J. D. Ullman,"Data Structures and Algorithms", Pearson, 2006.

BC7101	BIOMETRIC SYSTEMS	L T P C
		3 0 0 3

UNIT I   INTRODUCTION   9
Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes: verification, identification and biometric matching   – Performance measures in biometric systems: FAR, FRR, FTE rate, EER and ATV rate.

UNIT II   PHYSIOLOGICAL BIOMETRICS   9
Leading technologies : Finger-scan – Facial-scan – Iris-scan – Voice-scan – Hand Scan, Retina Scan - components, working principles, competing technologies, strengths and weaknesses.

UNIT III   AUTOMATED BIOMETRIC SYSTEM AND BEHAVIOURAL BIOMETRICS   9
Automated fingerprint identification systems - Leading technologies: Signature-scan – Keystroke scan – components, working principles, strengths and weaknesses.

UNIT IV   BIOMETRIC APPLICATIONS   9
Categorizing biometric applications – application areas: criminal and citizen identification, surveillance, PC/network access, e-commerce and retail/ATM – costs to deploy – other issues in deployment

UNIT V   PRIVACY AND STANDARDS IN BIOMETRICS   9
Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

TOTAL : 45 PERIODS

 REFERENCES:
1. Samir Nanavati, Michael Thieme, Raj Nanavati, "Biometrics – Identity Verification in a Networked World", Wiley-dreamtech India Pvt Ltd, New Delhi, 2003
2. Paul Reid, "Biometrics for Network Security", Pearson Education, New Delhi, 2004
3. John R Vacca, "Biometric Technologies and Verification Systems", Elsevier Inc, 2007
4. Anil K Jain, Patrick Flynn, Arun A Ross, "Handbook of Biometrics", Springer, 2008

BC7102   **DATABASE DESIGN AND SECURITY**   **L T   P C**
                                                                    3 0   0 3

UNIT I   INTRODUCTION   9
Data models, structure of relational databases, component of management system – DDL, DML, database languages, SQL standard, database users and administrators.

UNIT II   RELATIONAL DBMS   9
Design issues - basic normal forms and additional normal forms, Transforming E-R diagram to relations, Integrity constraints, Query processing and optimization

UNIT III   TRANSACTION PROCESSING   9
Transaction concept, concurrent execution, isolation, testing for serializability,   Concurrency control, lock based - time-stamp based - validation based protocols, multi-version schemes, deadlock handling.

UNIT IV   DATABASE SECURITY   9
Introduction to database security, security models, physical and logical security, security requirements, reliability and integrity, sensitive data, inference, multilevel databases and multilevel security, access control- mandatory and discretionary , security architecture, issues.

UNIT V   SECURITY ISSUES   9
Application access, security and authorization, authorization in SQL, encryption and authentication, secure replication mechanisms, Audit- logon/logoff, sources, usage and errors, changes, external audit system architecture, archive and secure auditing information

                                                              TOTAL : 45 PERIODS
REFERENCES:
1. Abraham Silberschatz, Hanry F Korth, Sudarshan S, "Database Systems Concepts", McGraw Hill, 2007.
2. Ron Ben Natan, "Implementing database security and auditing", Elsevier publications, 2005.
3. Hassan A. Afyduni, "Database Security and Auditing", Course Technology – Cengage Learning, NewDelhi, 2009.
4. Raghu Ramakrishnan, "Database Management Systems", McGraw Hill/ Third Edition, 2003
5. Ramez Elmasri, Shamkant B. Navathe , "Fundamentals of Database System" Addison Wesley, New Delhi/Fourth Edition 2004
6. M. Gertz, and S. Jajodia, Handbook of Database Security- Application and Trends, 2008, Springer.

BC7111   **ADVANCED DATA STRUCTURES LABORATORY**   **L T P C**
                                                                    0 0 4 2
 OBJECTIVES:
   * To learn to implement iterative and recursive algorithms.
   * To learn to design and implement algorithms using hill climbing and dynamic programming techniques.
   * To learn to implement shared and concurrent objects.
   * To learn to implement concurrent data structures.

LAB EXERCISES:
Each student has to work individually on assigned lab exercises. Lab sessions could be scheduled as one contiguous us four-hour session per week or two two-hour sessions per week. There will be about 15 exercises in a semester. It is recommended that all implementations are carried out in Java. If C or C++ has to be used, then the threads library will be required for concurrency. Exercises should be designed to cover the following topics:
   * Implementation of graph search algorithms.

- Implementation and application of network flow and linear programming problems.
- Implementation of algorithms using the hill climbing and dynamic programming design techniques.
- Implementation of recursive backtracking algorithms.
- Implementation of randomized algorithms.
- Implementation of various locking and synchronization mechanisms for concurrent linked lists, concurrent queues, and concurrent stacks.
- Developing applications involving concurrency.

TOTAL: 60 PERIODS

BC7112	TECHNICAL SEMINAR	L T P C
		0 0 2 1

The objective of this technical seminar is to enable the students to read technical article, comprehend and to share with others

The students should read a recent technical article from any of the leading reputed journals like:
- IEEE Transactions
- ACM
- Springer
- Elsevier publications

In the area of
- Biometric Systems
- Biometric Image Processing
- Intrusion Detection and Prevention Systems
- Cyber Security
- Ethical Hacking
- Network Defense

and present to the fellow students with a technical report. External assessment should be conducted along with web technology lab.

TOTAL:30 PERIODS

NE7202	NETWORK AND INFORMATION SECURITY	L T P C
		3 0 0 3

OBJECTIVES:
- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

UNIT I INTRODUCTION 9
An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks-Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT II CRYPTOSYSTEMS & AUTHENTICATION 9
Classical Cryptography-Substitution Ciphers-permutation Ciphers-Block Ciphers-DES- Modes of Operation- AES-Linear Cryptanalysis, Differential Cryptanalysis- Hash Function - SHA 512-Message Authentication Codes-HMAC - Authentication Protocols -

UNIT III PUBLIC KEY CRYPTOSYSTEMS 9
Introduction to Public key Cryptography- Number theory- The RSA Cryptosystem and Factoring Integer- Attacks on RSA-The ELGamal Cryptosystem- Digital Signature Algorithm-Finite Fields-Elliptic Curves Cryptography- Key management – Session and Interchange keys, Key exchange and generation-PKI

UNIT IV SYSTEM IMPLEMENTATION 9
Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem Secure Software Development: Secured Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls

UNIT V NETWORK SECURITY 9
Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL)-Intruders – HIDS- NIDS - Firewalls - Viruses

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- Implement basic security algorithms required by any computing system.
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Analyze the possible security attacks in complex real time systems and their effective countermeasures
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical derivation, modeling, and simulations
- Formulate research problems in the computer security field

REFERENCES:
1. William Stallings, "Cryptography and Network Security: Principles and Practices", Third Edition, Pearson Education, 2006.
2. Matt Bishop ,"Computer Security art and science ", Second Edition, Pearson Education, 2002
3. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007
4. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007
5. Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006
6. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, First Edition, 2006.
7. Network Security and Cryptography, Menezes Bernard, Cengage Learning, New Delhi, 2011
8. Man Young Rhee, Internet Security, Wiley, 2003
9. OWASP top ten security vulnerabilities: http://xml.coverpages.org/OWASP-TopTen.pdf

BC7201   **BIOMETRIC IMAGE PROCESSING**   **L T P C**
                                                                    3 0 0 3

UNIT I   FUNDAMENTALS OF IMAGE PROCESSING   9
Digital Image representation - Fundamental steps in Image Processing - Elements of Digital Image Processing Systems - Sampling and Quantization - Basic relationships between pixels - Imaging Geometry - Transformation Technology - The Fourier Transform, The Hadamard Transform, The Discrete Cosine Transform.   Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods - Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding - Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

UNIT II   FINGERPRINT BIOMETRICS   9
Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges - Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

UNIT III   FACE RECOGNITION   9
Detection and Location of Faces: Statistics-Based method, Knowledge-Based method - Feature Extraction and Face Recognition: Gray value Based method, Geometry Feature Based method, Neural Networks method.

UNIT IV   IRIS BIOMETRICS   9
Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Searching Algorithm - Texture Energy Feature.

UNIT V   FUSION IN BIOMETRICS   9
Introduction to Multibiometrics - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor level , Feature level, Rank level, Decision level fusion - Score level Fusion.

                                                           TOTAL :45 PERIODS
REFERENCES:
1. David D. Zhang, "Automated Biometrics: Technologies and Systems", Kluwer Academic Publishers, New Delhi, 2000.
2. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, "Digital Image Processing", Pearson Education, New Delhi, 2009
3. Arun A. Ross , Karthik Nandakumar, A.K.Jain, "Handbook of Multibiometrics", Springer, New Delhi, 2006.

BC7202   **INTRUSION DETECTION AND PREVENTION SYSTEMS**   **L T P C**
                                                                       3 0 0 3

UNIT I   INTRODUCTION   9
Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anamoly detection – specification based detection – hybrid detection

UNIT II   THEORETICAL FOUNDATIONS OF DETECTION   9
Taxonomy of anomaly detection system – fuzzy logic – Bayes theory – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering

UNIT III   ARCHITECTURE AND IMPLEMENTATION   9
Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture

UINIT IV   **LEGAL ISSUES AND ORGANIZATIONS STANDARDS**   **9**

Intrusion detection in security – Threat Briefing – Quantifying risk – Return on Investment (ROI) Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

UNIT V   **APPLICATIONS AND TOOLS:**   **9**

Tool Selection and Acquisition Process - Bro Intrusion Detection – Prelude Intrusion Detection - Cisco Security IDS - Snorts Intrusion Detection – NFR security

                                                   TOTAL : 45 PERIODS

REFERENCES:

1. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
3. Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.
4. Ankit Fadia and Mnu Zacharia, "Intrusiion Alert", Vikas Publishing house Pvt., Ltd, 2007.
5. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

BC7203   **CYBER SECURITY**   **L T P C**
                                                                       3 0 0 3

UNIT I   **INTRODUCTION**   **9**

Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures Challenges.

UNIT II   **CYBER SECURITY OBJECTIVES AND GUIDANCE**   **9**

Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project – Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.

UNIT III   **CYBER SECURITY POLICY CATALOG**   **9**

Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare.

UNIT IV   **CYBER MANGEMENT ISSUES**   **9**

Fiduciary Responsibility – Risk Management – Professional Certification – Supply Chain – Security Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

UNIT V   **CASE STUDY**   **9**

A Government's Approach to Cyber Security Policy.

                                                   TOTAL : 45 PERIODS

REFERENCES:

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
3. Richard A. Clarke, Robert Knake "Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010
4. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011

BC7211	CYBER SECURITY LABORATORY	L T P C
		0 0 3 2

1. Implementation of Substitution and Transposition ciphers
2. Implementation of Data Encryption Standard
3. Implementation of International Data Encryption Algorithm
4. Implementation of Advanced Encryption Standard
5. Implementation of RSA Algorithm
6. Implementation of Diffie-Hellman Key Exchange
7. Implementation of Message Authentication Codes
8. Implementation of Hash functions
9. Implementation of Digital Signature Standard
10. Hiding of confidential information within Image

TOTAL: 45 PERIODS

BC7212	BIOMETRIC IMAGE PROCESSING LABORATORY	L T P C
		0 0 3 2

List of Experiments
1. Image Enhancement
2. Image Segmentation
3. Image Acquisition - Fingerprint
4. Feature Extraction - Fingerprint
5. Image Acquisition - Face
6. Feature Extraction - Face
7. Image Acquisition - Iris
8. Feature Extraction - Iris
9. Multimodal Biometrics - Serial
10. Multimodal Biometrics - Parallel

TOTAL: 45 PERIODS

BC7301	ETHICAL HACKING AND NETWORK DEFENSE	L T P C
		3 0 0 3

UNIT I   ETHICAL HACKING AND SOCIAL ENGINEERING   9
Introduction - Certified Ethical Hackers – Network and Computer Attacks – Ethical Hacking Plan – Hacking Methodology. Footprinting Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering – Performing Social Engineering Attacks - Social Engineering Countermeasures.

UNIT II   SERVICE SCANNING   9
Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps - Shell Scripting. Enumeration: Introduction - Enumerating Windows, Symbian, Java OS, Android and NetWare Operating Systems.

UNIT III   HACKING NETWORKS   9
Hacking Web Servers: Web Application – Web Application Vulnerabilities – Tools for Web Attackers and Security Testers. Hacking Wireless Network: Wireless Technology – Wireless Network Standards – Authentication – Wardriving – Wireless Hacking – Protecting Networks with Security Devices.

UNIT IV   HACKING OPERATING SYSTEMS   9

Windows: Vulnerabilities – Choosing Tools – Information Gathering – RPC – Null Sessions – Share Permissions – Hardcore Vulnerability Exploitation. Linux: Vulnerabilities – Information Gathering – Unconnected Services - .rhosts and hosts.equiv Files – NFS – File Permissions – Buffer Overflow.

UNIT V   HACKING APPLICATIONS   9

Messaging Systems – Web Applications – Mobile Applications - Databases - Reporting Results.

TOTAL: 45 PERIODS

REFERENCES:
1. Michael T. Simpson, "Ethical Hacking and Network Defense", Cengage Learning, New Delhi, 2010.
2. Kevin Beaver, "Hacking for Dummies", Wiley Publication, India, 2007.
3. Ankit Fadia, "Unofficial Guide to Ethical Hacking", Macmillan Company, New Delhi, 2001.
4. Stuart McClure, Joel Scambray and Goerge Kurtz, "Hacking Exposed Network Security Secrets & Solutions", Tata Mcgrawhill Publishers, 2010.
5. Bensmith, and Brian Komer, "Microsoft Windows Security Resource Kit", Prentice Hall of India, 2010.

BC7001   MULTICORE ARCHITECTURES AND SECURITY ANALYSIS   L T P C
3 0 0 3

OBJECTIVES:
- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multicore architectures
- To expose the students to warehouse-scale and embedded architectures

UNIT I   FUNDAMENTALS OF QUANTITATIVE DESIGN AND ANALYSIS   9

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Case Studies of Multicore Architectures.

UNIT II   RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES   9

Programming Models and Workloads for Warehouse-Scale Computers – Architectures for Warehouse-Scale Computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

UNIT III   ARCHITECTURES FOR EMBEDDED SYSTEMS   9

Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

UNIT IV   SECURITY ANALYSIS   9

Basic components of Security - Confidentiality - Integrity, Availability – Threats Security policies - types , role of trust - types of access control

UNIT V   AUTHENTICATION AND CONFINEMENT   9

Basics, Passwords: attacking, countering, password ageing Biometrics Confinement Problem - Introduction, isolation virtual machines, sandboxes, covert channels, detection analysis, mitigation

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Identify the limitations of ILP and the need for multicore architectures
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism
- Critically analyze the different types of inter connection networks
- Discuss the architecture of GPUs, warehouse-scale computers and embedded processors

REFERENCES:

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill Education, 2003
3. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.
4. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A Hardware/ Software Approach" , Morgan Kaufmann / Elsevier, 1997.

BC7002	SOFTWARE ENGINEERING	L T P C
		3 0 0 3

OBJECTIVES:

- To provide information about wider engineering issues that form the background to develop complex, evolving (software-intensive) systems.
- To plan a software engineering process to account for quality issues and non-functional requirements.
- To employ a selection of concepts and techniques to complete a small-scale analysis and design in mini projects.
- To impart knowledge to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management.

UNIT I   INTRODUCTION   9

Software Engineering – Product and process – process models - Waterfall Life cycle model – Spiral Model – Prototype Model – fourth Generation Techniques – Agile methods.

UNIT II   REQUIREMENT ANALYSIS   9

Software Requirements Analysis and Specification – Software Requirements – Problem Analysis – Requirements Specification – Validation – Metrics – Summary.

UNIT III   SOFTWARE DESIGN   9

Abstraction – Modularity – Software Architecture – Cohesion – Coupling – Various Design Concepts and notations – Real time and Distributed System Design – Documentation – Dataflow Oriented design – Designing for reuse – Programming standards.

UNIT IV   SOFTWARE TESTING   9

Coding – Programming Practice – Top-down and Bottom-up - structured programming – Information Hiding – Programming style – Internal Documentation Verification – Code Reading – Static Analysis – Symbolic Execution – Code Inspection or Reviews – Unit Testing – Fundamentals – Functional Testing versus structural Testing Coding.

UNIT V   SOFTWARE MAINTENANCE AND   SOFTWARE METRICS   9

Need for Software maintenance – Maintenance models - SCM – Version Control – SCM process – Software Configuration Items – Taxonomy – Basics of Case tools - Scope of Software Metrics – Classification of metrics – Measuring Process and Product attributes – Direct and Indirect measures – Reliability – Software Quality Assurance – Standards.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to:

- Familiarize the basic concepts of Software design and implementation.
- Perform software testing on various applications.
- Apply various software metrics on software quality products.

REFERENCES:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Third Edition, Narosa publications, 2011.
2. Ian Sommerville, "Software engineering", Ninth Edition, Pearson Education Asia, 2010.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach",   Seventh Edition, Tata McGraw-Hill International Edition, 2009.

BC7003	APPLIED CRYPTOGRAPHY	L T P C
		3 0 0 3

UNIT I   INTRODUCTION   9

Cryptography and modern cryptography – The setting of private-key encryption – Historical ciphers and their cryptanalysis – Basic principles of modern cryptography – Services, Mechanisms and Attacks – OSI security architecture.

UNIT II   SYMMETRIC TECHNIQUES   9

Definition – Substitution ciphers – Transposition ciphers - Stream and block ciphers - A5, RC4. Characteristics of good ciphers   - Data Encryption Standard (DES) – International Data Encryption Algorithm – Advanced Encryption Standard – Block cipher modes of operation – Confidentiality using symmetric encryption.

UNIT III   ASYMMETRIC TECHNIQUES   9

Principles of Public Key Cryptosystems – The RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Elliptic Curve Cryptography – over reals, prime fields and binary fields, Applications, Practical considerations. Cryptography in Embedded Hardware

UNIT IV   MESSAGE AUTHENTICATION   9

Authentication requirements – Authentication functions – Message Authentication Codes (MAC) – Hash functions – Security of hash functions and MACs.

UNIT V   HASH AND DIGITAL SIGNATURES   9

MD5 Message Digest Algorithm – Secure Hash Algorithm (SHA) –RIPMED160 - HMAC - Digital Signatures - Authentication Protocols - Digital Signature Standard (DSS)

TOTAL : 45 PERIODS

REFERENCES:

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, New Delhi, 2010.
2. Ingemar J.Cox, Matthew L.Miller, Jeffrey A.Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, New York, 2008.
3. William Stallings, "Cryptography and Network Security, Prentice Hall, New Delhi, 2006.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
5. Jonathan Katz, Yehuda Lindell, "Introduction to Modern Cryptography", Chapman & Hall/CRC, New York, 2007.
6. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York, 2004.
7. Atul Kahate, "Cryptography and Network Security", Tata McGrew Hill, 2003.

SE7003   **MACHINE LEARNING**   **L T P C**
                                                                          3 0 0 3

UNIT I   INTRODUCTION   9
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and
Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm –
Heuristic Space Search.

UNIT II   NEURAL NETWORKS AND GENETIC ALGORITHMS   9
Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back
Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search –
Genetic Programming – Models of Evaluation and Learning.

UNIT III   BAYESIAN AND COMPUTATIONAL LEARNING   9
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length
Principle –Bayes Optimal Classifier –Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief
Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite
Hypothesis Spaces – Mistake Bound Model.

UNIT IV   INSTANT BASED LEARNING   9
K-Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case
Based Learning.

UNIT V   ADVANCED LEARNING   9
Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules –
Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical
Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm –
Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

                                                                TOTAL: 45 PERIODS
REFERENCES:
1. Tom M. Mitchell, "Machine Learning", McGraw-Hill edition, 1997
2. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine
   Learning)", The MIT Press 2004
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer
   Verlag, 2001
4. Pattern recognition and machine learning by Christopher Bishop, Springer Verlag, 2006.

CP7025   **DATA MINING TECHNIQUES**   **L T P C**
                                                                               3 0 0 3

UNIT I   INTRODUCTION TO DATA MINING   9
Introduction to Data Mining – Data Mining Tasks – Components of Data Mining Algorithms – Data
Mining supporting Techniques – Major Issues in Data Mining – Measurement and Data – Data
Preprocessing – Data sets

UNIT II   OVERVIEW OF DATA MINING ALGORITHMS   9
Overview of Data Mining Algorithms – Models and Patterns – Introduction – The Reductionist
viewpoint on Data Mining Algorithms – Score function for Data Mining Algorithms- Introduction –
Fundamentals of Modeling – Model Structures for Prediction – Models for probability Distributions
and Density functions – The Curve of Dimensionality – Models for Structured Data – Scoring
Patterns – Predictive versus Descriptive score functions – Scoring Models with Different
Complexities – Evaluation of Models and Patterns – Robust Methods.

UNIT III CLASSIFICATIONS 9

Classifications – Basic Concepts – Decision Tree induction – Bayes Classification Methods – Rule Based Classification – Model Evaluation and Selection – Techniques to Improve Classification Accuracy – Classification: Advanced concepts – Bayesian Belief Networks- Classification by Back Propagation – Support Vector Machine – Classification using frequent patterns.

UNIT IV CLUSTER ANALYSIS 9

Cluster Analysis: Basic concepts and Methods – Cluster Analysis – Partitioning methods – Hierarchical methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Advanced Cluster Analysis: Probabilistic model based clustering – Clustering High – Dimensional Data – Clustering Graph and Network Data – Clustering with Constraints.

UNIT V ASSOCIATION RULE MINING AND VISUALIZATION 9

Association Rule Mining – Introduction – Large Item sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rules – Visualization of Multidimensional Data – Diagrams for Multidimensional visualization – Visual Data Mining – Data Mining Applications – Case Study: WEKA.

TOTAL: 45 PERIODS

REFERENCE S:
1. Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining: Concepts and Techniques", Third Edition (The Morgan Kaufmann Series in Data Management Systems), 2012.
2. David J. Hand, Heikki Mannila and Padhraic Smyth "Principles of Data Mining" (Adaptive Computation and Machine Learning), 2005
3. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", 2003
4. Soman, K. P., Diwakar Shyam and Ajay V. "Insight Into Data Mining: Theory And Practice", PHI, 2009.

NE7003   WEB ENGINEERING   L T P C
**   3 0 0 3**

OBJECTIVES:
* To understand the issues and process of Web design.
* To learn the concepts of Web design patterns and page design.
* To understand and learn the scripting languages with design of web applications.
* To learn the maintenance and evaluation of web design management.

UNIT I INTRODUCTION TO WEB ENGINEERING 9

History of web Development, Evolution and Need for Web Engineering, World Wide Web, Introduction to TCP/IP and WAP , DNS, Email, TelNet, HTTP and FTP, Introduction to Browser and search engines, Web Servers, Features of web servers, caching, case study-IIS, Apache, Configuring web servers.

UNIT II INFORMATION ARCHITECTURE 9

The role of Information Architect, Collaboration& Communication, Organizing Information, Organizational Challenges, Organizing Web sites parameters and Intranets, Creating Cohesive Websites, Architectural Page Mockups, Design Sketches, Navigation Systems, Searching Systems Good & bad web design, Process of Web Publishing, Phases of Web Site development, Requirements Engineering for Web Applications.

UNIT III   HTML & DHTML   9
HTML Basic Concept, Static & dynamic HTML, Structure of HTML documents, HTML Elements, Linking in HTML, Anchor Attributes, Image Maps, Meta Information, Image Preliminaries, Layouts, backgrounds, Colors and Text, Fonts, Tables, Frames and layers, Audio and Video Support with HTML Database integration, CSS, Positioning with Style sheets, Forms Control, Form Elements, Introduction to CGI PERL, JAVA SCRIPT, PHP, ASP , Cookies Creating and Reading Cookies.

UNIT IV   XML   9
Introduction of XML, Validation of XML documents, DTD, Ways to use XML,XML for data files HTML Vs XML, Embedding XML into HTML documents, Converting XML to HTML for Display, Displaying XML using CSS and XSL, Rewriting HTML as XML, Relationship between HTML, SGML and XML, web personalization , Semantic web, Semantic Web Services, Ontology.

UNIT V   APPLICATIONS AND SECURITY   9
E-commerce Business Models, The Internet and World Wide Web, Modes of Electronic Commerce, Approaches to safe Electronic Commerce, Electronic Cash and Electronic Payment Schemes, Online Security and Payment Systems, E-commerce Marketing Concepts, Advertising on the Internet, Electronic Publishing issues, approaches, Legalities & technologies, Privacy & Security, Web Security, Encryption schemes, Secure Web document, Digital Signatures and Firewalls, Cyber crime and laws, IT Act.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course,   the students will be able to
- Identify the various issues of web design process and evaluation.
- Determine templates for web pages and layout.
- Develop simple web applications using scripting languages.
- Determine the various issues of web project development.
- Address the core issues of web page maintenance and evaluation.

REFERENCES:
1. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication, 2007
2. Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, McGraw-Hill, 2009.
3. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill
4. NEIL GRAY ,"Web server Programming" Wiley
5. CHRIS BATES Web Programming :Building Internet applications, Wiley
6. Moller, "An Introduction to XML and Web Technologies", Pearson Education New Delhi, 2009

BC7004	ACCESS CONTROL AND IDENTITY MANAGEMENT SYSTEM	L T P C
		3 0 0 3

UNIT I   ACESS CONTROL   9
Access control – Introduction - Attenuation of privileges – Trust and Assurance – Confinement problem - Security design principles– Identity Management models – local –Network - federal – global web identity – XNS approach for global Web identity - Centralized enterprise level Identity Management.

UNIT II   TRUST PARADIGMS IN COMPUTING   9
Elements of trust paradigms in computing – Third party approach to identity trust – Kerberos - Explicit third party authentication paradigm – PKI approach to trust establishment - Attribute certificates – Generalized web of trust models – Examples.

UNIT III   MANDATORY ACESS CONTROL   9

Mandatory access control - Comparing information flow in BLP and BIBA models – Combining the BLP and BIBA models – Chinese wall problem.

UNIT IV   DISCRETIONARY ACCESS CONTROL   9

Discretionary access control and Access matrix model – definitions – Safety problem – The take grant protection model – Schematic protection model – SPM rules and operations – Attenuating– Applications

UNIT V   ROLE BASED ACCESS CONTROL   9

Role based access control – Hierarchical Access Control -   Mapping of a mandatory policy to RABC – Mapping discretionary control to RBAC – RBAC flow analysis – Separation of Duty in RBAC – RBAC consistency properties -   The privileges perspective of separation of duties – Functional specification for RBAC .

TOTAL : 45 PERIODS

REFERENCES
1. Messaoud Benantar, "Access Control Systems, Security, Identity Management and Trust Models", Springer Publications, 2006.
2. Messoud Benantar, "Access Control Systems: Security, Identity Management and Trust Models", Springer, 2009.
3. Elena Ferrari and M. Tamer A-zsu , "Access Control In Data Management Systems", Morgan & Claypool Publishers, 2010.

EL7001	ARTIFICIAL INTELLIGENCE	L T P C
		3 0 0 3

OBJECTIVES:
To provide in-depth knowledge about
* Searching Techniques
* Knowledge Representation
* Learning

OUTCOMES:
Students will be able to
* Explain Uniform search strategies and searching with partial information
* Understand Backtracking, Local and Adversarial Search
* Describe Learning decision trees
* Explain Probabilistic language processing

UNIT I   INTRODUCTION   8

Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents – Problem Solving – problem solving agents – example problems – searching for solutions – uniformed search strategies – avoiding repeated states – searching with partial information.

UNIT II   SEARCHING TECHNIQUES   10

Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments – Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems – Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.

UNIT III   KNOWLEDGE REPRESENTATION   10

First order logic - syntax and semantics – Using first order logic – Knowledge engineering **–** Inference – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining **–**   Resolution **–** Knowledge representation **–** Ontological Engineering **–** Categories and objects – Actions **–** Simulation and events **–** Mental events and mental objects.

UNIT IV   LEARNING   9

Learning from observations **–**   forms of learning **–** Inductive learning - Learning decision trees **–** Ensemble learning **–**   Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods **–**   Learning with complete data **–** Learning with hidden variable **–** EM algorithm **–** Instance based learning **–** Neural networks **–** Reinforcement learning – Passive reinforcement learning **–** Active reinforcement learning **–** Generalization in reinforcement learning.

UNIT V   APPLICATIONS   8

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction **–**   Probabilistic language processing **–** Probabilistic language models – Information retrieval – Information Extraction – Machine translation.

TOTAL : 45 PERIODS

REFERENCES:
1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education / Prentice Hall of India, 2004.
2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", Second Edition, Tata McGraw Hill, 2003.
4. George F. Luger, "Artificial Intelligence-Structures And Strategies For Complex Problem Solving", Pearson Education / PHI, 2002.

BC7005	OPERATING SYSTEMS SECURITY	L	T	P	C
		3	0	0	3

UNIT I   INTRODUCTION   7

Operating system concepts – Functions – Structure of Operating system – Types of operating system

UNIT II   PROCESS MANAGEMENT   10

Introduction to processes – Process Scheduling - Threads-CPU Scheduling objectives, criteria – Types of scheduling algorithms – Performance comparison – Inter process communications-Synchronization – Semaphores – Dead lock Prevention, Recovery, Detection and Avoidance

UNIT III   MEMORY MANAGEMENT   10

Single contiguous allocation – Partitioned allocation – Paging – Virtual memory concepts – Swapping – Demand paging – Page replacement algorithms – Segmentation.

UNIT IV   DEVICE AND FILE MANAGEMENT   8

Principles of I/O hardware – I/O software – Disks – Disk Scheduling Algorithms--File Systems - Files and Directories- File System Implementation - Allocation Methods.

UNIT V   SECURITY ISSUES   10

Protection in General Purpose Operating Systems: protected objects and methods of protection – memory and address protection – control of access to general objects – file protection Mechanisms – user authentication - Designing Trusted Operating Systems.

TOTAL :45 PERIODS

REFERENCES:
1. Silberschatz A, Galvin P, Gagne G, "Operating Systems Concepts", John Wiley & Sons, Singapore, 2006.
2. Michael Palmer, Guide to Operating Systems Security", Course Technology – Cengage Learning, New Delhi, 2008
3. Charles P. Pleeger, "Security in Computing", Prentice Hall, New Delhi, 2009
4. Deitel H M, "Operating Systems ", PHI/ Pearson Education, New Delhi, 2004.

BC7006	TRUST MANAGEMENT IN E-COMMERCE	L T P C
		3 0 0 3

UNIT I   INTRODUCTION TO E-COMMERCE   9
Introduction to E-Commerce – Network and E-Commerce – Types of E-Commerce – E-Commerce Business Models: B2C, B2B, C2C, P2P and M-commerce business models – E-Commerce Payment systems: Types of payment system – Credit card E-Commerce transactions– B2C E-Commerce Digital payment systems – B2B payment system.

UNIT II   E-COMMERCE SECURITY   9
Security and Encryption: E-Commerce Security Environment – Security threats in E-Commerce environment – Policies, Procedures and laws.

UNIT III   TRUST IN E-COMMERCE   9
Inter-organizational trust in E-Commerce: Need – Trading partner trust – Perceived benefits and risks of E-Commerce – Technology trust mechanism in E-Commerce – Perspectives of organizational, economic and political theories of inter-organizational trust – Conceptual model of inter-organizational trust in E-Commerce participation.

UNIT IV   TRUSTED COMPUTING PLATFORM   9
Introduction to trusted computing platform: Overview – Usage Scenarios – Key components of trusted platform – Trust mechanisms in a trusted platform

UNIT V   TRUST MODELS   9
Trusted platforms for organizations and individuals – Trust models and the E-Commerce domain.

TOTAL: 45 PERIODS

 REFERENCES
1. Kenneth C. Laudon and Carol Guercio Trave, "E-Commerce Business Technology Society", Pearson Education, 2005.
2. Pauline Ratnasingam, "Inter-Organizational Trust for Business-to-Business E- Commerce", IRM Press, 2005.
3. Siani Pearson, et al, "Trusted Computing Platforms: TCPA Technology in Context" Prentice Hall PTR, 2002.

BC7007	BIOMETRIC SECURITY	L T P C
		3 0 0 3

UNIT I   BIOMETRICS   9
Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

UNIT II   PHYSIOLOGICAL BIOMETRIC TECHNOLOGIES   9

Physiological Biometric Technologies: Fingerprints - Technical description –characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description -   characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.

UNIT III   BEHAVIORAL BIOMETRIC TECHNOLOGIES   9

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses- deployment.A

UNIT IV   MULTI BIOMETRICS   9

Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.

UNIT V   CASE STUDIES   9

Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

TOTAL : 45 PERIODS

REFERENCES
1. Samir Nanavathi, Michel Thieme, and Raj Nanavathi, "Biometrics -Identity verification in a network", Wiley Eastern, 2002.
2. John Chirillo and Scott Blaul," Implementing Biometric Security", Wiley Eastern Publications, 2005.
3. John Berger," Biometrics for Network Security", Prentice Hall, 2004.

BC7008   **DISTRIBUTED SYSTEMS SECURITY**   **L T P C**
                                                                  3 0 0 3

UNIT I   INTRODUCTION   9

Introduction – Distributed Systems, Distributed Systems Security.   Security in Engineering: Secure Development Lifecycle Processes - A Typical Security Engineering Process - Security Engineering Guidelines and Resources. Common Security Issues and Technologies: Security Issues, Common Security Techniques.

UNIT II   HOST-LEVEL THREATS AND VULNERABILITIES   9

Host-level Threats and Vulnerabilities: Transient code Vulnerabilities - Resident Code Vulnerabilities - Malware: Trojan Horse – Spyware - Worms/Viruses – Eavesdropping - Job Faults.   Infrastructure-Level Threats and Vulnerabilities: Network-Level Threats and Vulnerabilities - Grid Computing Threats and Vulnerabilities – Storage Threats and Vulnerabilities – Overview of Infrastructure Threats and Vulnerabilities.

UNIT III   APPLICATION-LEVEL THREATS AND VULNERABILITIES   9

Application-Layer Vulnerabilities - Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws   - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements - Service-Level Threats and Vulnerabilities - Service-Level Attacks - Services Threat Profile.

UNIT IV HOST-LEVEL SOLUTIONS 9

Sandboxing – Virtualization - Resource Management - Proof-Carrying Code -Memory Firewall – Antimalware. Infrastructure-Level Solutions: Network-Level Solutions - Grid-Level Solutions - Storage-Level Solutions. Application-Level Solutions: Application-Level Security Solutions.

UNIT V SERVICE-LEVEL SOLUTIONS 9

Services Security Policy - SOA Security Standards Stack – Standards in Dept - Deployment Architectures for SOA Security - Managing Service-Level Threats - Compliance in Financial Services **-** SOX Compliance - SOX Security Solutions - Multilevel Policy-Driven Solution Architecture - Case Study: Grid **-** The Financial Application **-** Security Requirements Analysis. Future Directions **-** Cloud Computing Security **–** Security Appliances **-** Usercentric Identity Management **-** Identity-Based Encryption (IBE) **-** Virtualization in Host Security.

TOTAL:45 PERIODS

REFERENCES

1. Abhijit Belapurakar, Anirban Chakrabarti and et al., "Distributed Systems Security:
2. Issues. Processes and solutions", Wiley, Ltd., Publication, 2009.
3. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarrajan, "Distributed Systems Security: Issues, Processes and Solutions", Wiley publications, 2009.
4. Rachid Guerraoui and Franck Petit, "Stabilization, Safety, and Security of Distributed Systems", Springer, 2010.

NE7002 **MOBILE AND PERVASIVE COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES :

- To understand the basics of Mobile Computing and Personal Computing
- To learn the role of cellular networks in Mobile and Pervasive Computing
- To expose to the concept of sensor and mesh networks
- To expose to the context aware and wearable computing
- To learn to develop applications in mobile and pervasive computing environment

UNIT I INTRODUCTION 9

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices

UNIT II 3G AND 4G CELLULAR NETWORKS 9

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III SENSOR AND MESH NETWORKS 9

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks

UNIT IV   CONTEXT AWARE COMPUTING & WEARABLE COMPUTING   9

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware

Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications

UNIT V   APPLICATION DEVELOPMENT   9

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone

TOTAL:45 PERIODS

OUTCOMES:
 At the end of the course the student should be able to
- Design a basic architecture for a pervasive computing environment
- Design and allocate the resources on the 3G-4G wireless networks
- Analyze the role of sensors in Wireless networks
- Work out the routing in mesh network
- Deploy the location and context information for application development
- Develop mobile computing applications based on the paradigm of context aware computing and wearable computing

REFERENCES:
1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2nd ed, Tata McGraw Hill, 2010.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley,2010.
3. .Pei Zheng and Lionel M Li, 'Smart Phone & Next Generation Mobile Computing', Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein, 'Fundamentals of Mobile and Pervasive Computing', TMH, 2005
5. Jochen Burthardt et al, 'Pervasive Computing: Technology and Architecture of Mobile Internet Applications', Pearson Education, 2003
6. Feng Zhao and Leonidas Guibas, 'Wireless Sensor Networks', Morgan Kaufmann Publishers, 2004
7. Uwe Hansmaan et al, 'Principles of Mobile Computing', Springer, 2003
8. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
9. Mohammad s. Obaidat et al, "Pervasive Computing and Networking",John wiley
10. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, 2009
11. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwiebert "Fundamentals of Mobile and Pervasive Computing, ", McGraw-Hill, 2005

CU7001   REAL TIME EMBEDDED SYSTEMS   L T P C
**   3 0 0 3**

UNIT I   INTRODUCTION TO EMBEDDED COMPUTING   9

Complex systems and microprocessors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

UNIT II   COMPUTING PLATFORM AND DESIGN ANALYSIS   9

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

UNIT III   PROCESS AND OPERATING SYSTEMS   9

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems – Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT IV   HARDWARE ACCELERATES & NETWORKS   9

Accelerators – Accelerated system design – Distributed Embedded Architecture – Networks for Embedded Systems – Network based design – Internet enabled systems.

UNIT V   CASE STUDY   9

Hardware and software co-design - Data Compressor - Software Modem – Personal Digital Assistants – Set–Top–Box. – System-on-Silicon – FOSS Tools for embedded system development.

TOTAL: 45 PERIODS

REFERENCES:

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", dreamtech press, 2005.
4. Tim Wilmshurst, "An Introduction to the Design of Small Scale Embedded Systems", Pal grave Publisher, 2004.
5. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc-Graw Hill, 2004.
6. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.

NE7201   NETWORK PROGRAMMING   L T P C
                                                                        3 0 0 3

OBJECTIVES :
- To understand interprocess and inter-system communication
- To understand socket programming in its entirety
- To understand usage of TCP/UDP / Raw sockets
- To understand how to build network applications

UNIT I   INTRODUCTION   9

Overview of UNIX OS - Environment of a UNIX process - Process control – Process relationships Signals – Interprocess Communication- overview of TCP/IP protocols

UNIT II   ELEMENTARY TCP SOCKETS   9

Introduction to Socket Programming –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

UNIT III   APPLICATION DEVELOPMENT   9

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

UNIT IV   SOCKET OPTIONS, ELEMENTARY UDP SOCKETS   9

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

UNIT V   ADVANCED SOCKETS   9

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination –TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

TOTAL : 45 PERIODS

OUTCOMES:

- To write socket API based programs
- To design and implement client-server applications using TCP and UDP sockets
- To analyze network programs

REFERENCES:

1. W. Richard Stevens, B. Fenner, A.M. Rudoff, "Unix Network Programming – The Sockets Networking API", 3rd edition, Pearson, 2004.
2. W. Richard Stevens, S.A Rago, "Programming in the Unix environment", 2nd edition, Pearson, 2005.

NE7012   **SOCIAL NETWORKS ANALYSIS**   **L T P C**
                                                                     3 0 0 3

OBJECTIVES:

- To understand the components of the social network
- To model and visualize the social network
- To mine the users in the social network
- To understand the evolution of the social network
- To mine the interest of the user

UNIT I   INTRODUCTION   9

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks

UNIT II   MODELING AND VISUALIZATION   9

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

UNIT III   MINING COMMUNITIES   9

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT IV   EVOLUTION   9

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models

UNIT V   TEXT AND OPINION MINING   9

Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course,   the students will be able to
- Work on the internals components of the social network
- Model and visualize the social network
- Mine the behaviour of the users in the social network
- Predict the possible next outcome of the social network
- Mine the opinion of the user

REFERENCES:
1. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011
2. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
3. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.
4. Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.
5. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
6. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.
7. Toby Segaran, "Programming Collective Intelligence", O'Reilly, 2012

CP7022   **SOFTWARE DESIGN**   **L T P C**
                                                                    3 0 0 3

OBJECTIVES:
- Analyze specifications
- Describe approaches to design
- Develop design documentation
- Evaluate the design

UNIT I   SOFTWARE DESIGN PRINCIPLES   9
Introduction – Design process – Managing complexity – Software modeling and notations – Abstraction – Modularity – Hierarchy – Coupling - Cohesion – Design guidelines and checklists – Refactoring

UNIT II   OO DESIGN   9
Object model – Classes and objects – Object oriented analysis – Key abstractions and mechanisms – Object oriented design – Identifying design elements – Detailed design – Case studies.

UNIT III   DESIGN PATTERNS   9
Introduction to patterns – Design context – Reusable solutions – Documenting reusable solutions – Standard patterns from GOF book.

UNIT IV   FUNCTION AND SERVICE ORIENTED DESIGNS   9
Structural decomposition – Detailed Design – Function oriented design Case study – Services – Service identification – Service design – Service composition – choreography and orchestration – Service oriented design Case study

UNIT V   USER CENTERED DESIGN AND DESIGN REVIEW   9
Introduction to user centered design – Use in context – Interface and interaction – User centered design principles – Task analysis – Evaluation – Introduction to design review– Testing the design – Walk throughs – Review against check lists.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Describe different approaches to desigining a software application
- Analyze specifications and identify appropriate design strategies.
- Develop an appropriate design for a given set of requirements
- Identify applicatble design patterns for the solution
- Abstract and document reusable design patterns
- Evaluate a given design against the specifications

REFERENCES:
1. Grady Booch et al., "Object Oriented Analysis and Design with Applications", 3rd Edition, Pearson, 2010.
2. Carlos Otero, "Software Engineering Design: Theory and Practice", CRC Press, 2012
3. David Budgen, "Software Design", 2nd Edtion, Addison Wesley, 2003
4. Alan Shalloway and James R Trott, "Design Patterns Explained: A New Perspective on Object-Oriented Design", 2nd Edition, Addison-Wesley Professional, 2004
5. Hassan Gomaa, "Software Modeling and Design", Cambridge University Press, 2011
6. Eric Gamma et al., "Design Patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley Professional, 1994
7. Ian Sommerville, "Software Engineering", 9th Edition, Addison-Wesley, 2010
8. M B Rosson and J M Carroll, "Usability Engineering: Scenario-Based Development of Human-Computer Interaction", Morgan Kaufmann, 2002

BC7009   **STEGANOGRAPHY AND DIGITAL WATERMARKING**   **L T P C**
                                                                          3 0 0 3

UNIT I   STEGANOGRAPHY   9
Steganography communication – Notation and terminology – Information-theoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis

UNIT II   WATERMARKING   9
Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems. Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.

UNIT III   WATERMARKING WITH SIDE INFORMATION & ANALYZING ERRORS   9
Informed Embedding – Informed Coding – Structured dirty-paper codes - Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates.

UNIT IV   PERCEPTUAL MODELS   9
Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches - Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients

UNIT V   WATERMARK SECURITY & AUTHENTICATION   9
Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

                                                              TOTAL: 45 PERIODS

REFERENCES:
1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Margan Kaufmann Publishers, New York, 2008.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, "Digital Watermarking", Margan Kaufmann Publishers, New York, 2003.
3. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Applications of Digital Watermarking and Contest Protection", Artech House, London, 2003.
4. Juergen Seits, "Digital Watermarking for Digital Media", IDEA Group Publisher, New York, 2005.
5. Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.
6. Stefan Katzenbelsser and Fabien A. P. Petitcolas, "Information hiding techniques for Steganography and Digital Watermarking", ARTECH House Publishers, January 2004.
7. Jessica Fridrich, "Steganography in Digital Media: Principles, Algorithms, and Applications", Cambridge university press, 2010.
8. Steganography, Abbas Cheddad, Vdm Verlag and Dr. Muller, "Digital Image" Aktienge sells chaft & Co. Kg, Dec 2009.
9. Ingemar Cox, Matthew Miller,Jeffrey Bloom,Jessica Fridrich and Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, Nov 2007.

BC7010   **SECURITY THREATS**   **L T P C**
                                                                      3 0 0 3

UNIT I   SECURITY THREATS   9
Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities
– Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats,
Cyber crimes.

UNIT II   NETWORK THREATS   9
Active/ Passive – Interference – Interception – Impersonation – Worms –Virus – Spam's –
Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots - IP Spoofing - ARP
spoofing - Session Hijacking - Sabotage-Internal treats- Environmental threats - Threats to Server
security.

UNIT III   SECURITY THREAT MANAGEMENT   9
Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness -
Vulnerability sources and assessment- Vulnerability assessment tools - Threat identification -
Threat Analysis - Threat Modeling - Model for Information Security Planning.

UNIT IV   SECURITY ELEMENTS   9
Authorization and Authentication - types, policies and techniques – Security certification -
Security monitoring and Auditing - Security Requirements Specifications - Security Polices
and Procedures, Firewalls, IDS, Log Files, Honey Pots

UNIT V   ACCESS CONTROL   9
Access control, Trusted Computing and multilevel security - Security models, Trusted Systems,
Software security issues, Physical and infrastructure security, Human factors – Security
awareness, training , Email and Internet use policies.

REFERENCES
1. Joseph M Kizza, "Computer Network Security", Springer Verlag, 2005
2. Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.
3. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice",
   Prentice Hall, 2008.
4. Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic
   Principles & Application", Thomson Delmar Learning, 2004.

CP7019   **MANAGING BIG DATA**   **L T P C**
                                                                      3 0 0 3

OBJECTIVES:
   • Understand big data for business intelligence
   • Learn business case studies for big data analytics
   • Understand nosql big data management
   • Perform map-reduce analytics using Hadoop and related tools

UNIT I   UNDERSTANDING BIG DATA   9
What is big data – why big data – convergence of key trends – unstructured data – industry
examples of big data – web analytics – big data and marketing – fraud and big data – risk and big
data – credit risk management – big data and algorithmic trading – big data and healthcare – big
data in medicine – advertising and big data – big data technologies – introduction to Hadoop –
open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing
analytics – inter and trans firewall analytics

UNIT II   NOSQL DATA MANAGEMENT   9

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and combining – composing map-reduce calculations

UNIT III   BASICS OF 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   MAPREDUCE APPLICATIONS   9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT V   HADOOP RELATED TOOLS   9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration.
Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts.
Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course,   the students will be able to
- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

REFERENCES:
1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
7. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
8. Alan Gates, "Programming Pig", O'Reilley, 2011.

NE7011   MOBILE APPLICATION DEVELOPMENT   L T P C
**   3 0 0 3**

OBJECTIVES:
- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution

UNIT I INTRODUCTION 5

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II BASIC DESIGN 8

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III ADVANCED DESIGN 8

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV TECHNOLOGY I - ANDROID 12

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V TECHNOLOGY II - IOS 12

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the students will be able to   Completion of the course,
1. Describe the requirements for mobile applications
2. Explain the challenges in mobile application design and development
3. Develop design for mobile applications for specific requirements
4. Implement the design using Android SDK
5. Implement the design using Objective C and iOS
6. Deploy mobile applications in Android and iPone marketplace for distribution

REFERENCES:

1. http://developer.android.com/develop/index.html
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
4. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS Development: Exploring the iOS SDK", Apress, 2013.

BC7011   **WIRELESS SECURITY**   **L T P C**
                                                                     3 0 0 3

UNIT I WIRELESS TECHNOLOGIES 9

Introduction to wireless technologies- Wireless data networks-Personal Area Networks - Transmission Media – WLAN standards - Securing WLANS - Countermeasures - WEP (Wired Equivalence Protocol).

UNIT II   WIRELESS THREATS   9
Kinds of security breaches - Eavesdropping - Communication Jamming - RF interference - Covert wireless channels - DOS attack – Spoofing - Theft of services - Traffic Analysis - Cryptographic threats - Wireless security Standards.

UNIT III   SECURITY IN DATA NETWORKS   9
Wireless Device security issues - CDPD security (Cellular Digital Packet Data)-GPRS security (General Packet Radio Service) - GSM (Global System for Mobile Communication) security – IP security
"

UNIT IV   WIRELESS TRANSPORT LAYER SECURITY   9
Secure Socket Layer - Wireless Transport Layer Security - WAP Security Architecture - WAP Gateway.

UNIT   BLUETOOTH SECURITY   9
Basic specifications – Piconets – Bluetooth security architecture – Scatternets – Security at the baseband layer and link layer – Frequency hopping – Security manager – Authentication – Encryption – Threats to Bluetooth security.

TOTAL : 45 PERIODS

REFERENCES:
1. Nichols and Lekka, "Wireless Security-Models, Threats and Solutions", Tata McGraw – Hill, New Delhi, 2006.
2. Merritt Maxim and David Pollino, "Wireless Security", Osborne/McGraw Hill, New Delhi, 2005.
3. William Stallings, "Cryptography and Network Security - Principles and practices, Prentice Hall, New Delhi, 2006.

IF7202	CLOUD COMPUTING	L T P C
		3 0 0 3

OBJECTIVES:
- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system

UNIT I   CLOUD ARCHITECTURE AND MODEL   9
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture.
Cloud Models: Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II   VIRTUALIZATION   9
Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III   CLOUD INFRASTRUCTURE   9
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV   PROGRAMMING MODEL   9
Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

UNIT V   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 - Identity Management and Access Control – Autonomic Security.

TOTAL:45 PERIODS

OUTCOMES:
- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player
- Choose the appropriate Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services
- Set a private cloud

REFERENCES:
1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India, 2011.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer.
8. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
9. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, 'Mastering Cloud Computing", TMGH,2013.
10. Gautam Shroff, Enterprise Cloud Computing, Cambridge University Press, 2011
11. Michael Miller, Cloud Computing, Que Publishing, 2008
12. Nick Antonopoulos, Cloud computing, Springer Publications, 2010

BC7012   **CYBERCRIME INVESTIGATIONS AND DIGITAL FORENSICS**   **L T P C**
                                                                      3 0 0 3

UNIT I   INTRODUCTION   9
Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber
Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT II   CYBER CRIME ISSUES   9
Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and
Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy,
Intellectual Property, Mail Bombs, Exploitation ,Stalking and Obscenity in Internet, Digital laws and
legislation, Law Enforcement Roles and Responses.

UNIT III   INVESTIGATION   9
Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence
Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail
Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of
Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV   DIGITAL FORENSICS   9
Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools,
Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint
Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network
Forensics

UNIT V   LAWS AND ACTS   9
Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian
Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

                                                                    TOTAL: 45 PERIODS
REFERENCES:
1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage
   Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata
   McGraw -Hill, New Delhi, 2006.
3. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
4. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
   "Understanding Forensics in IT ", NIIT Ltd, 2005.