With effect from the academic year 2015-16

SCHEME OF INSTRUCTION AND EXAMINATION

M.Tech – I YEAR

COMPUTER NETWORKS AND INFORMATION SECURITY

SEMESTER-I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Period per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessi-onals
		THEORY					
1.		CORE-I	3		3	80	20
2.		CORE-II	3		3	80	20
3.		CORE-III	3		3	80	20
4.		CORE-IV	3		3	80	20
5.		ELECTIVE-I	3		3	80	20
6.		ELECTIVE-II	3		3	80	20
		PRACTICALS					
1.	IT 5131	Software Lab- I (Cryptography and Networks)	-	3	-	-	50
2.	IT 5132	Seminar-I	-	3	-	-	50
		TOTAL	18	6	-	480	220

Core Subjects

IT 5101 Number Theory
IT 5102 Advanced Algorithms
IT 5103 Advanced Computer Networks
IT 5104 Cryptography and Network Security
IT 5105 Information Systems Security
IT 5106 Database Security

Elective I & II

IT 6101 Advanced Operating Systems
IT 6102 Distributed Databases
IT 6103 Machine Learning
IT 6104 Distributed Systems
IT 6105 Information Retrieval Systems
IT 6106 Web Engineering
IT 6107 Software Reuse Techniques
IT 6108 Human Computer Interaction

SCHEME OF INSTRUCTION AND EXAMINATION

M.Tech – I YEAR

COMPUTER NETWORKS AND INFORMATION SECURITY

SEMESTER-II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Period per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessi-onals
		THEORY					
1.		CORE-V	3		3	80	20
2.		CORE-VI	3		3	80	20
3.		ELECTIVE-III	3		3	80	20
4.		ELECTIVE-IV	3		3	80	20
5.		ELECTIVE-V	3		3	80	20
6.		ELECTIVE-VI	3		3	80	20
		PRACTICALS					
1.	IT 5141	Software Lab- II (Advanced Algorithms &Database Security)	-	3	-	-	50
2.	IT 5142	Seminar-II	-	3	-	-	50
		TOTAL	18	6	-	480	220

Elective III & IV

IT 6111 Data Hiding
IT 6112 Electronic Commerce
IT 6113 Soft Computing
IT 6114 Data Mining
IT 6115 Grid Computing
IT 6116 Semantic Web
IT 6117 Mobile Adhoc and Sensor networks
IT 6118 Storage Management

Elective V & VI

IT 6121 Cloud Computing
IT 6122 Biometric Security
IT 6123 Forensic Computing
IT 6124 Software Quality & Testing
IT 6125 Simulation & Modeling
IT 6126 Digital Image Processing and Computer Vision
IT 6127 Web Mining
IT 6128 Software Project Management

SCHEME OF INSTRUCTION AND EXAMINATION

M.Tech – II YEAR

COMPUTER NETWORKS AND INFORMATION SECURITY

SEMESTER-III

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Period per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessi-onals
1.	IT 9101	Dissertation+ Project Seminar	-	6	-	-	100*

* 50 Marks to be given by the guide

* 50 Marks to be give by Viva Committee which includes Head, Guide and an Examiner

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With effect from Academic Year 2015 - 2016

SCHEME OF INSTRUCTION AND EXAMINATION

M.Tech – II YEAR

COMPUTER NETWORKS AND INFORMATION SECURITY

SEMESTER-IV

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Period per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessi-onals
1.	IT 9102	Dissertation	-	6	-	*Grade	-

* Grade: Excellent/Very Good/Good/Satisfactory/Unsatisfactory

IT 5101

NUMBER THEORY

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

1. To learn the basics concepts of number theory
2. To be familiar with linear congruences and Chinese remainder theorem
3. To know Fermat's little theorem, and Euler's extension of it;

Course Outcomes:

After the completion of the course, student will be able to

1. Solve the problems of elementary number theory
2. Apply number theory concepts to cryptography

UNIT – I : Divisibility and Primes : Division Algorithm, Euclid's algorithm for the greatest common divisor, Linear Diophantine equations, Prime numbers, fundamental theorem of arithmetic, infinitude of primes. Distribution of primes, twin primes, Goldbach conjecture, Fermat and Mersenne primes, Primality testing and factorization.

UNIT – II : Congruences, Congruences with a Prime-Power Modulus : Modular arithmetic, Linear congruences, Simultaneous linear congruences, Chinese Remainder Theorem, An extension of Chinese Remainder Theorem (with non-coprime moduli), Arithmetic modulo p, Fermat's little theorem, Wilson's theorem, Pseudo-primes and Carmichael numbers, Solving congruences modulo prime powers.

UNIT – III:Euler's Function and RSA Cryptosystem, Units Modulo an Integer : Definition of Euler function, examples and properties, Multiplicative property of Euler's function, RSA cryptography, The group of units modulo an integer, primitive roots, Existence of primitive roots.

UNIT – IV:Quadratic Residues and Quadratic Forms : Quadratic residues, Legendre symbol, Euler's criterion, Gauss lemma, law of quadratic reciprocity, Quadratic residues for prime-power moduli and arbitrary moduli.

UNIT – V: Binary quadratic forms, equivalent forms, Discriminant, principal forms, positive definite forms, indefinite forms, Representation of a number by a form-examples, Reduction of

positive definite forms, reduced forms, Number of proper representations, automorph, class number.

Suggested Reading :

1) G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.
2) Niven, H.S. Zuckerman & H.L. Montgomery, "Introduction to the Theory of Numbers", Wiley,2000.
3) D. Burton, "Elementary Number Theory", McGraw-Hill, 2005.

IT 5102

ADVANCED ALGORITHMS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

1. To understand asymptotic notation for representing Algorithmic complexity
2. To understand various algorithmic strategies like greedy method, divide and conquer and dynamic programming
3. To learn advanced algorithms for networks, string processing and geometry

Course Outcomes:

After the completion of the course, student will be able to

1. Formulate and seek known solutions to an algorithmic problem.
2. Select suitable algorithmic strategy and appropriate data structures for solving real world problems in various domains.
3. To read and understand current research publications in the area of algorithms.

UNIT-I

Algorithm Analysis: Asymptotic Notation, Amortization.

Basic Data Structures: Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tab1es.

Search Trees and Skip Lists: Ordered Dictionaries and Binary Search Trees, AVL Trees, Bounded- Depth Search Trees, Splay Trees, Skip Lists.

UNIT-II

Fundamental Techniques: The Greedy Method, Divide-and-Conquer, Dynamic Programming.

Graphs: The Graph Abstract Data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs.

UNIT-III

Weighted Graphs: Single-Source Shortest Paths, All-Pairs Shortest Paths, Minimum Spanning Trees.

Network Flow and Matching: Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum-Cost Flow.

UNIT-IV

Text Processing: Strings and Pattern Matching Algorithms, Tries, Text Compression, Text Similarity Testing.

Number Theory and Cryptography: Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols.

UNIT-V

Computational Geometry: Range Trees, Priority Search Trees, Quadtrees and k-DTrees, Convex Hulls.

Suggested Reading:

1) M T Goodrich, R Tornassia, "Algorithm Design - Foundations, Analysis, and Internet Algorithms ", John Wiley, 2002.
2) E Horowitz S Salmi, S Rajasekaran, "Fundamentals of Computer Algorithms" 2nd Edition, University Press, 2007.
3) Aho, A V Hopcraft, Ullman J D, "The design and analysis of Computer Algorithms", Pearson Education, 2007.
4) Hari Mohan Pandy, "Design Analysis and Algorithms", University Science Press, 2009.
5) Cormen, Lieserson, Rivest "Introduction to Algorithms", 2nd Edition, PHI, 2003.

IT 5103

ADVANCED COMPUTER NETWORKS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

1. To build an understanding of the fundamental concepts of computer networks and networking devices
2. To understand basic concepts involved in the design of computer networks such as layering, architectures, protocols and services;
3. To familiarize with the recent developments on the Internet such as Ipv6 and mobile IP
4. To understand major concepts involved in WLANs, Optical, Wireless sensor and mobile Adhoc networks

Course Outcomes:

After the completion of the course, student will be able to

1. To list the applications of different types of networks such as WANs, LANs, WLANs, optical, mobile Adhoc and sensor networks
2. Describe the concepts, protocols and differences underlying the design and implementation of various types of computer networks
3. To propose, implement and evaluate new ideas for solving design issues related to these networks

UNIT- I

Computer Networks and the Internet: What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, History of Computer Networking and the Internet - **Foundation of Networking Protocols:** 5-layer TCP/IP Model, 7-layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM - **Networking Devices:** Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure.

UNIT- II

The Link Layer and Local Area Networks: Link Layer: Introduction and Services, Error-Detection and Error-Correction techniques- Multiple Access Protocols, Link Layer Addressing, Ethernet, Interconnections: Hubs and Switches, PPP: The Point-to-Point Protocol, Link Visualization - **Routing and Internetworking:** Network-Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intradomain Routing Protocols, Interdomain Routing Protocols, Congestion Control at Network Layer.

UNIT- III

Logical Addressing: IPv4 Addresses, IPv6 Addresses - **Internet Protocol:** Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6 - **Multicasting Techniques and Protocols:** Basic Definitions and Techniques, Intra-domain Multicast Protocols, Inter-domain Multicast Protocols, Node-Level Multicast algorithms - **Transport and End-to-End Protocols:** Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control - **Application Layer:** Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Socket Programming with TCP and UDP, Building a Simple Web Server.

UNIT- IV

Wireless Networks and Mobile IP: Infrastructure of Wireless Networks, Wireless LAN Technologies. IEK1: S02.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs) - **Optical Networks and WDM Systems:** Overview of Optical Networks, Basic Optical Networking Devices, Large-Scale Optical Switches, Optical Routers, Wavelength Allocation in Networks, Case Study: An All-Optical Switch.

UNIT- V

VPNs, Tunneling and Overlay Networks: Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks-**VoIP and Multimedia Networking:** Overview of IP Telephony, VoIP Signaling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol - **Mobile Ad-Hoc Networks:** Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks - **Wireless Sensor Networks:** Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols.

Suggested Reading:

1) James E Kuro.se, Keith W. Ross "Computer Networking: A Top-Down Approach Featuring the Internet", Third Edition, Pearson Education, 2007.
2) Nader F. Mir "Computer and Communication Networks", Pearson Education, 2007.
3) Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata McGraw Hill, 2007.
4) Greg Tomsho.EdTittel, David Johnson, "Guide to Networking Essentials", Fifth Edition, Thomson.
5) S. Keshav, "An Engineering Approach to Computer Networking ",Pearson Education.
6) Diane Teare, Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education (CISCO Press).
7) Andrew S. Tanenbaum, "Computer Networks", Fourth Edition, Prentice Hall.
8) A. Farrel,"The Internet and Its Protocols", Elsevier.

IT 5104

CRYPTOGRAPHY AND NETWORK SECURITY

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

1. To understand security threats, security services and mechanisms.
2. To understand different symmetric and asymmetric cryptography algorithms.
3. To understand network and email security protocols like SSL, PGP and S/MIME

Course outcomes:

Student will be able to

1. Demonstrate detailed knowledge of the role of cryptography to protect data.
2. Identify common network security vulnerabilities/attacks.

UNIT-I

Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality, Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle attacks, General Threats to Computer Network, Worms, Viruses, Trojans

UNIT-II

Secret Key Cryptography: DES, Triple DES, AES, Key distribution, Attacks

Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks.

UNIT-III

Integrity, Authentication and Non-Repudiation: Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

UNIT-IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's.

Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards.

UNIT-V

Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE).

Suggested Reading:

1) William Stallings, "Cryptography and Network Security", 5th Edition, Pearson, 2013.
2) Behrouz A Forouzan, "Cryptography and Network Security", TMH, 2009.
3) Joseph MiggaKizza, "A Guide to Computer Network Security ", Springer, 2010.
4) Dario Cataiano, Contemporary Cryptology ", Springer, 2010.
5) William Stallings, "Network Security Essentials: Application and standards", 4th Edition, Pearson, 2012.

IT 5105

INFORMATION SYSTEMS SECURITY

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

1. To understand fundamental concepts of information security and the key practices and processes for managing security effectively.
2. To describe software program deficiencies and the vulnerabilities associated with them.
3. To familiarize withaccess controls and authentication as they are used to secure systems and information.
4. To understand security vulnerabilities that affect operating systems and how they can be mitigated.

Course Outcomes:

A student completing this course is expected to be able to:

1. State the basic concepts in information systems security, including security technology and principles, software security and trusted systems, and IT security management.
2. State the requirements and mechanisms for identification and authentication.
3. State the criteria of evaluating secure information systems, including evaluation of secure operating systems and secure database systems.

UNIT- I

Information Systems in Global Context: Basicsandimportance of Information Systems, Changing Nature of Information Systems, Global Information Systems: Role of Internet and Web Services.

Threats to Information Systems: New Technologies Open Door to the Threats, Information-Level Threats versus Network-Level Threats, Threats and Attacks, Classifications of Threats and Assessing Damages, Protecting Information Systems Security.

UNIT- II

Information Security Management in Organizations: Information Security Management (ISM)Context, Policy, Standards, Guidelines and Procedures, Security Scenario in the Financial Sector, Information Security Management System (ISMS), Organizational Responsibility, Information Security Awareness Scenario.

Building Blocks of Information Security: Principles of Information Systems Security, Three Pillars of Information Security, Information Classification, Criteria for Classification of Data and Information, Information Classification: Variousroles.

UNIT- III

Information Security Risk Analysis: Terms and Definitions for Risk Analysis of Information Security, Risk Management and Risk Analysis, Approaches and Considerations in Risk Analysis, Auditing Perspective on Risk Analysis.

Intrusion Detection for Securing the Networks: Intrusion Monitoring and Detection, Intrusion Detection for Information Systems Security.

Firewalls for Network Protection: Firewalls, Demilitarized Zone (DMZ), Need and Protection provided by Firewalls, Proxy Servers, Topologies for Different Types of Firewalls.

Virtual Private Networks for Security: VPN, Need and Role of a VPN for an Enterprise, Working of VPN,VPN Architecture.

UNIT- IV

Security of Electronic Mail Systems: Today's Email Usage Scenario, Email System Mechanism, Security Threats posed by Emails, Protection from Threats, Governance for Emails Systems.

Security of Databases: Database Security Issues, Federated Databases: Need and Security Issues, Securing the Mobile Databases, Securing Connectivity with Enterprise Databases, Data Integrity as a parameter for security, Database Security Policy.

Security of Operating Systems: Operating Systems role in Information Systems Application, Operating System Types, Functions and Tasks, Network Operating Systems and Security, Host Security and OS Hardening, Patched Operating System, OS hardening fundamentals.

UNIT- V

Security Models, Frameworks, Standards and Methodologies: Terminology, Methodologies for Information Systems Security.

Systems Security Engineering Capability Maturity Model - The SSE-CMM : Definition Nature, Scope and Importance,Target Audience for the SSE-CMM, SSE-CMM - Structure and Architecture, Process Areas of the SSE-CMM.

Auditing for Security: Need for Security Audits in Organizations, Organizational Roles and Responsibilities, Types and Approaches to Security Audits, Technology-based Audits - Vulnerability Scanning and Penetration Testing, Phases in Security Audit.

Suggested Reading :

1) Nina Godbole,**"**Information Systems Security: Security Management, Metrics, Frameworks And Best Practices", Wiley India Pvt.Ltd.,2013
2) Michael E. Whitman and Hebert J Mattord, "Principles of Information Security", 4th edition Ed. Cengage Learning 2011
3) Thomas R Peltier, JustingPeltier, John Blackley, "Information Security. Fundamentals", Auerbacj Publications 2010

4) Detmar W Straub, Seymor Goodman, Richard L Baskerville, “Information Security: Policy
5) Processes and Practices”, PHI 2008
6) Marks Merkow and Jim Breithaupt, “Information Security: Principle and Practices”, Pearson Education, 2007.

IT 5106

DATABASE SECURITY

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

1. To get a good understanding of security concepts related to databases and Operating system.
2. To study various security models
3. To understand various intrusion detection techniques.

Course outcomes:

1. Effectively design a secure database
2. Identify and address various security flaws in existing database systems
3. Apply various authentication techniques to Operating systems

UNIT - I

Introduction: Introduction to Databases, Security Problems in Databases, Security Controls Conclusions.

UNIT - II

Security Models: Introduction Access Matrix Model, Take-Grant Model, ActenModel,Wood model, Discussion on discretionary models, Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, Smith and Winslett model, The Lattice Model for the Flow Control.

UNIT - III

Security Mechanisms: Introduction User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security Functionalities in Some Operating Systems,

Security Software Design: Introduction, A Methodological Approach to Security.

Software Design, Secure Operating System, Design Secure DBMS Design, Security Packages, Database Security Design.

UNIT - IV

Statistical Database Protection & Intrusion Detection Systems: Introduction Statistics Concepts and assumptions, inference protection techniques, A general framework for comparing inference protection techniques.

Introduction IDES System, MIDAS, TDBMS, Wisdom and sense anomaly detection system, trends in intrusion detection.

UNIT - V

Models for the Protection of New Generation Database Systems: Introduction, security in active databases, security in object-oriented databases, SORION Model for the Protection of Object-Oriented Databases. The Orion Model, A Model for the Protection of Active Databases, Modeling multilevel entites through single-level objects, Observations on OODBMS security.

Suggested Reading:

1) S. Castano, M. Fugini, G. Martella, P. Samarati (eds.), Database Security, Addison-Wesley, 1994.
2) RonBenNatan, Implementing Database Security and Auditing, Elsevier, Indian reprint 2006
3) Michael Gertz, SushilJajodia, Handbook of Database Security : Applications and Trends, Springer, 2008

IT 6101

ADVANCED OPERATING SYSTEMS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

At the end of this course, student should get familiarized with

1. To understand basic concepts of advanced operating systems.
2. The management of resources in advanced operating systems.
3. Security & protection in computer systems and mechanisms used in building multiprocessor operating systems.

Course Outcomes:

After completion of this course, the student will be able to

1. Able to apply principles of advanced operating systems
2. Configure and maintain suitable operating system in different environments.
3. Analyze the requirements, and ensure security and protection in operating systems.

UNIT-I

Architecture of Distributed Systems: Types, Distributed OS, Issues in Distributed Operating Systems.

Theoretical Foundations: Global Clock, Lamport's Logical Clock, Vector Clocks, Global State, Termination Detection.

UNIT-II

Distributed Mutual Exclusion: Classification, requirement, performance, non-token based algorithms, Lamport's algorithm, the Richart-Agarwala algorithm, token-based algorithm,Suzuki K asamil's broadcast algorithm, Singhals heuristic algorithm.

Deadlock Detection: Resource Vs Communication deadlock, A graph - theoretic model, prevention, avoidance, detection, control organization, centralized deadlock-detection algorithm, the completely centralized algorithm, the HO-Ramamoorthy algorithm, Distributed deadlock detection algorithm - path - pushing, edge-chasing, hierarchical deadlock detection algorithm, menace-muntz and Ho- Ramamoorthy algorithm.

Agreement Protocols: The system model, The Byzantine agreement, The consensus problem.

UNIT-III

Distributed File System: Mechanisms, Design Issues.

Case Studies: Sun NFS, Sprite File System, DOMAIN, Coda File System.
Distributed shared memory: Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols and Design Issues.

UNIT-IV
Distributed Scheduling: Issues in Load Distribution, Components of Algorithm, Stability Load Distributing Algorithm, Performance.
Failure Recovery: Backward, Forward Error Recovery in Concurrent Systems, Consistent Set of Check Points, Synchronous and Asynchronous Check Pointing and Recovery.

UNIT-V
Fault Tolerance: Issues, atomic actions and committing, Commit protocols, Non-Blocking Commit Protocols, Voting Protocols, Dynamic Voting Protocols.
Protection and Security: Access Matrix Model, Implementation of Access Matrix, Safety in the Access Matrix Model, Private Key, Public key,Kerberos System.

Suggested Reading:
1) Singhal M. Shivaratri N.G, "Advanced concepts in operating systems" Tata Mc-Graw-Hill Edition, 2001.
2) Pradeep K Sinha, "Distributed Operating Systems Concepts and Design", PHI, 2002.
3) Andrew S. Tanenbaum. "Distributed Operating Systems", Pearson Education India, 2001.

IT 6102

DISTRIBUTED DATABASES

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

At the end of the course student should

1. Design high-quality relational databases and database applications.
2. Translate complex conceptual data models into logical and physical database designs.
3. Gain an understanding of Oracle11g and XML
4. Have a outline knowledge about Parallel and Distributed Databases
5. Gain experience in Performance Tuning

Course Outcomes:

1. After completion of this course, the student will be able to
2. Analyze and evaluate modeling and development methods/techniques in Object-based Databases
3. Understand and analyze query processing and optimization.
4. Understand how distributed and parallel databases are implemented, and how applications can be designed for those databases.
5. Able to gain insight into some advanced topics in database such as Performance Tuning, spatial databases, temporal databases.

UNIT -I

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design.

UNIT - II

Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries.

UNIT - III

The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions.

Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency

Control.

UNIT - IV

Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection.

UNIT - V

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects.

Database Integration, Scheme Translation, Scheme Integration, Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multi-database Concurrency Control, Multi-database Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies.

Suggested Reading:

1) "Distributed Databases Principles & Systems", Stefano Ceri, Giuseppe Pelagaui, TMH.
2) "Principles of Distributed Database Systems", M. Tamer Ozsu, Patrick Valduriez, Pearson Education, 2nd Edition.
3) Chhanda Ray, “Distributed Database Systems”, Always Learning Pearson.

IT 6103

MACHINE LEARNING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

At the end of the course, student can

1. Discuss basic concepts of Machine Learning , problems and the other concepts such as algorithms, heuristics, solution spaces and relate them to brute force searching.
2. Understand the mathematical concepts related to Multilayer perception.
3. Demonstrate familiarity with various techniques in Machine Learning and their applications as well as general questions related to analyzing and handling large data sets

Course Outcomes :

Upon successful completion of the course, student

1. Acquire the basic knowledge of Machine Learning, identify algorithms, machine learning problems
2. gets ability to apply the knowledge of computing and mathematics appropriate to the discipline
3. Identifies various machine learning techniques such as decision tree, artificial neural networks, Bayesian learning, genetic algorithms, clustering and classification algorithms etc. and their applications
4. gets working knowledge of applying the ML algorithms to the available large data sets with the available simulation packages such as WEKA , Clementine etc.

UNIT-I

Introduction: Learning, Types of Machine Learning.

Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm. **Learning with Trees:** Constructing Decision Trees, CART, Classification Example.

UNIT-II

Linear Discriminants: The Perceptron, Linear Separability.

Linear Regression Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back.

Propagation SUPPORT Vector Machines: Optimal Separation, Kernels.

UNIT-III

Some Basic Statistics: Averages, Variance and Covariance, The Gaussian.

The Bias-Variance Tradeoff Bayesian learning: Introduction, Bayes theorem, Bayes Optimal Classifier, Naive Bayes Classifier.

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators.

Genetic Programming Ensemble learning: Boosting, Bagging.

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

UNIT-V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison.

Suggested Reading:

1) Tom M. Mitchell, "Machine Leaming ",MacGraw Hill, 1997.
2) Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 2009.
3) Margaret H Dunham, "Data Mining", Pearson Edition, 2003.
4) GalitShmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley India Edition, 2007.
5) RajjallShinghal, "Pattern Recognition ", Oxford University Press, 2006.

IT 6104

DISTRIBUTED SYSTEMS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives:

At the end of the course, student can

1. Learn the fundamental architectures and distributed system models
2. Understand principles of distributed systems.
3. UnderstandVarious security issues in distributed environment
4. Compare and analyze the differences between conventional and distributed transactions

Course Outcomes:

Upon successful completion of the course, student

1. Will be able to understand distributed client server paradigms.
2. Will be able to understand and develop distributed communication mechanisms like RPC and RMI.
3. Will be able to understand and develop distributed technologies like DCOM, GLOBE and CORBA.

UNIT – I

INTRODUCTION: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.

ARCHITECTURES: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures;Architectures versus Middleware- Interceptors, General Approaches to Adaptive Software, Discussion; Self-Management in Distributed Systems-The Feedback Control Model, Example: Systems Monitoring with Astrolabe, Example: Differentiating Replication Strategies in Globule, Example: Automatic Component Repair Management in Jade.

UNIT – II

PROCESSES: Threads- Introduction to Threads, Threads in Distributed Systems; Virtualization, The Role Of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

COMMUNICATION: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing; Asynchronous RPC, Example: DCE RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication, Example: IBM'S WebSphere Message-Queuing System; Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication, Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT-III

NAMING: Names, Identifiers, and Addresses, Flat Naming, Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming, Name Spaces, Name Resolution, the Implementation of a Name Space, Example: The Domain Name System; Attribute-based Naming, Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations;

SYNCHRONIZATION: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes, Election Algorithms- Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large Scale Systems.

UNIT-IV

CONSISTENCY AND REPLICATION: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, A Cache-Coherence Protocols, Implementing Client-Centric Consistency.

FAULT TOLERANCE, Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery- Introduction, Checkpointing, Message Logging, Recovery-Oriented Computing.

UNIT-V

SECURITY: Introduction to Security- Security Threats, Policies, and Mechanisms, Design Issues, Cryptography; Secure Channels- Authentication, Message Integrity and Confidentiality,

Secure Group Communication, Example: Kerberos; Access Control- General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service; Security Management- Key Management, Secure Group Management, Authorization Management.

DISTRIBUTED OBJECT-BASED SYSTEMS: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes- Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming- CORBA Object References, Globe Object References; Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance- Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security- Example: GLOBE , Security for Remote Objects.

Suggested Reading:

1) Andrew S. Tanenbaum and Van Steen "Distributed Systems", Second Edition, PHI,2014
2) Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", 3rd Edition, Pearson education, 2002.
3) SunithaMahajan, Seema Shah, “Distributed Computing”, SecondEdision, Oxford University Press, , 2013
4) Kai Hwang, GeofferyC.Fox, Jack J.Dongarra, “Distributed and Cloud Computing”, Morgan Kaufmann publishers, 2012.
5) S.Ghosh, Chapman & Hall/CRC, “Distributed Systems”, Taylor & Francis Group, 2010.
6) Ajay D. KshemakalyaniMukeshSinghal, “Distributed Computing, Principles, Algorithms and Systems”, Cambridge, 2010.

IT 6105

INFORMATION RETRIEVAL SYSTEMS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student get

1. familiarized the different IR models.
2. to develop an overall understanding of the different text retrieval models, query languages and query evaluation
3. to develop a thorough understanding of the technical details of the important processes such as indexing, compression and searching.

Course outcomes:

Upon successful completion of the course

1. Have obtained sufficient theoretical background to develop efficient Information retrieval systems.
2. Have gained sufficient insight which would help in conducting research in the area.

UNIT-I

Introduction: Basic concepts, Past present and Future of IRS, Retrieval Process. Modeling: Introduction, A Taxonomy of IR Models, Retrieval: Adhoc and Filterig, A formal characterization of IR Models, Classic IR, Set Theoretic Models, Algebraic Models, Probabilistic Models

UNIT-II

Structured Text Retrieval Models, Models for Browsing
Retrieval Evaluation: Introduction, Reference Collections.
Query languages: Introduction, Keyword-based querying, pattern Matching, Structural Queries, Query Protocols.

UNIT-III

Query operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic Global Analysis.
Text and Multimedia Languages and Properties: Introduction, Meta Data, Text, Markup Languages, Multimedia.

UNIT-IV

Text operations: Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing Text Compression Techniques.
Indexing: Introduction, Inverted Files, Other Indices for Text Searching, Boolean Queries,

UNIT-V

Searching: Sequential Searching, Pattern Matching, Structural Queries, Compression.

Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR.

Suggested Reading:

1) Ricardo, Baeza-yates, BerthierRibeiro-Neto, "Modern Information Retrieval" Pearson Education, 2008
2) David A. Grossman, OphirFrieder, "Information Retrieval - Algorithms and Heuristics", Springer, 2nd Edition (Distributed by Universities Press), 2004.
3) Gerald Kowalski, "Information Retrieval Systems: Theory and Implementation", Springer.
4) William B. Frakes, Ricardo Baeza- Yates, "Information Retrieval – Data Structures & Algorithms", Pearson Education, 2008.

IT 6106

WEB ENGINEERING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:
At the end of the course, student will be able to
1. Understand the concepts, principles and methods of Web engineering. *f*
2. Familiarize with Web application development software tools and environments currently available on the market.
3. Understand the web metrics & quality and Web resource management.

Course outcomes:
Upon successful completion of the course will be able to
1. Apply web development processes for developing web applications.
2. Apply proven engineering methodologies to improve performance and effectiveness of web sites in marketing products and services.
3. Use web intelligence to analysis and customization of web based electronic catalog.

UNIT-I

Web Engineering: Concepts and Reference Model.

Web Engineering: Introduction and Perspectives, Web Engineering Resources Portal (WEP): A reference Model and Guide.

UNIT-II

Web Application Development: Methodologies and Techniques.

Web Application Development Methodologies, Relationship Analysis: A Technique to Enhance Systems Analysis for Web Development, Engineering Location - Based Services in the Web.

UNIT-III

Web Metrics and Quality: Models and Methods.

Architectural Metrics for E-Commerce: A Balance between Rigor and Relevance.

The equal Approach to the Assessment of E-Commerce Quality: A Longitudinal Study of Internet Bookstore, Web Cost.

Estimation: An Introduction.

UNIT-IV

Web Resource Management: Models and Techniques Ontology Supported Web Content Management, Design Principles and Applications of XRML.

UNIT-V

Web Maintenance and Evolution: Techniques and Methodologies Program Transformations for Web Application Restructuring, The Requirements of Methodologies for Developing Web Applications, A Customer based Methodology for Improving Web Business Systems.

Web Intelligence: Techniques and Applications

Analysis and Customization of Web-Based Electronic Catalogs, Data Mining using Qualitative Information on the Web.

Suggested Reading:

1) WoojongSuh, "Web Engineering: Principles and Techniques ", Idea Group Publications, 2005.
2) Roger Pressman, David Lowe, “Web Engineering: A Practioner's Approach”, McGraw-Hill. 2009.
3) GertiKappel, Birgit Proll, Siegried Reich, Werner Retschitzegger , “Web Engineering”, Wiley India Pvt. Ltd.
4) Emilia Mendes, Nile Mosley “Web Engineering”, Kinndle Edition, Springer, 2005.

IT 6107

SOFTWARE REUSE TECHNIQUES

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course Objectives

At the end of the course, student should be able to understand concepts of

1. design patterns usage
2. creation of patterns
3. Structural, behavioral and architectural patterns

Course Outcomes

Upon successful completion of the course, students can

1. Design patterns for various software models
2. Application of design patterns.

UNIT-I

Software Reuse Success Factors
Reuse Driven Software Engineering Business
Object Oriented Software Engineering Applications and Component Subsystem
Use Case Components
Object Components

UNIT-II

Design Patterns: Introduction.
Creational Patterns: Factory, Factory Method, Abstract Factory, Singleton, Builder Prototype.

UNIT-III

Structural Patterns: Adapter, Bridge, Composite, Decorator, facade, flyweight, Proxy.
Behavioral Patterns: Chain of Responsibility, Command, Interpreter.

UNIT-IV

Behavioral Pattern: Iterator, Mediator, Memento, Observer, Stazte, Strategy, Template, Visitor.
Other Design Patterns: Whole Part, Master-Slave, View Handler, forwarder-Receiver.
Client: Dispatcher - Server, **Publisher:** Subscriber.

UNIT-V

Architectural Patterns: Layers, Pipes and Filters, Black Board, Broker, Model View Controller.

Presentation: Abstraction-control, Micro Kernel, Reflection.

Suggested Reading:

1) Ivar Jacobson, Martin Griss, Patrick Johnson, "Software Reuse, Architecture, Process and Organization for Business Success", ACM Press, 1997.
2) Erich Gamma, Richard Helm, Johnson. John Vlissides, "Design Patterns", Addison, 1995, Pearson Education.
3) Frank Buschmann etc., "Pattern Oriented Software Architecture, Volume 1, Wiley 1996.
4) James W Cooper, "Java Design Patterns, a Tutorial", Addison 2000, Pearson Education.

IT 6108

HUMAN COMPUTER INTERACTION

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. design, evaluate and deploy usable, effective technologies
2. produce a low-fidelity prototype for an interactive product based upon a simple list of interaction design principles.

Course outcomes:

Upon successful completion of the course students can

1. Think constructively & analytically about how to design and evaluate interactive technologies.
2. determine the most appropriate HCI methods to meet the needs of a practical software development project

UNIT - I:

Interaction Paradigms: Computing Environments, Analyzing Interaction Paradigms, Interaction Paradigms.

Interaction Frameworks and Styles: Frameworks for Understanding Interaction, Coping with Complexity, Interaction Styles.

UNIT - II:

Interaction Design Process: Iterative Design, User-Centered Design, Interaction Design Models, Overview of Interaction Design Models.

Discovery: Discovery Phase Framework, Collection, Interpretation, Documentation.

Design: Conceptual Design, Physical Design, Evaluation, Interface Design standards, Designing the Facets of the Interface.

UNIT - III:

Design Principles: Principles of Interaction Design, Comprehensibility, Learnability, Effectiveness/Usefulness, Efficiency/Usability, Grouping, Stimulus Intensity, Proportion, Screen Complexity, Resolution/Closure, Usability Goals.

Interaction Design Models: Model Human Processor, Keyboard Level Model, GOMS,Modeling Structure, Modeling Dynamics, Physical Models.

Usability Testing: Usability, Usability Test, Design the Test, Prepare for the Test, Perform the Test, Process the Data.

UNIT - IV:

Interface Components: The WIMP Interface, Other Components.

Icons: Human Issues Concerning Icons, Using Icons in Interaction Design, Technical Issues Concerning Icons.

Color: The Human Perceptual System, Using Color in Interaction Design, Color Concerns for Interaction Design, Technical Issues Concerning Color.

UNIT - V:

Text: Human Issues Concerning Text, Using Text in Interaction Design, Technical Issues Concerning Text.

Speech and Hearing: The Human Perceptual System, Using Sound in Interaction Design, Technical Issues Concerning Sound.

Touch and Movement: The Human Perceptual System, Using Haptics in Interaction Design, Technical Issues Concerning Haptics.

Suggested reading:

1. Steven Heim, "The Resonant Interface: HCI Foundations for Interaction Design", Addison-Wesley, 2007.
2. J. Preece, Y. Rogers, and H. Sharp, "Interaction Design: Beyond Human-Computer Interaction", Wiley & Sons, 2nd Ed., 2007.
3. Ben Shneiderman ,Catherine Plaisant,"Designing the User Interface: Strategies for Effective Human-Computer Interaction", 5th edition, Addison-Wesley, 2009.

IT 5131

SOFTWARE LAB- I
(CRYPTOGRAPHY AND NETWORKS)

Instruction	3 Periods per Week
Duration of University Examination	--
University Examination	--
Sessional	50 Marks

1. Implementation of Mono alphabetic cipher
2. Implementation of Vigenere cipher (Polyalphabetic substitution)
3. Implementation of Hill cipher and Gauss cipher
4. Implementation of S-DES algorithm for data encryption
5. Implement RSA asymmetric (public key and private key)-Encryption. Encryption key (e, n) & (d, n)
6. Generate digital signature using Hash code.
7. Generate digital signature using MAC code.
8. Study of MD5 hash function and implement the hash code using MD5.
9. Study of SHA-1 hash function and implement the hash code using SHA-1.
10. Design an Authentication application like Kerberos in C++ / JAVA.
11. Study and implement IP spoofing in TCP/UDP environment.
12. Attacks on Smart cards: A case study.

Note: Tools / Apparatus Required: O.S.: Microsoft Windows (any) / Linux
Packages: Turbo/Borland/GNU - C/C++

IT 5132

SEMINAR – I

Instruction	3 Periods per Week
Duration of University Examination	--
University Examination	--
Sessional	50 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his / her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members. Students are to be exposed to following aspects of Seminar presentations.

Literature Survey
Organization of material
Preparation of PowerPoint presentation slides
Technical Writing

Each Student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board
2. Give 20 minutes of PowerPoint presentation followed by 10 minutes of discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and written presentation in addition to their involvement in the discussion.

IT 6111

DATA HIDING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. Understand basic concepts of data hiding.
2. Understand basic concepts of digital water marking.
3. Understand basic concepts of steganography.

Course outcomes:

Upon successful completion of the course students can

1. Understand difference between data hiding and cryptography.
2. Design and develop digital water marking system.
3. Design and develop steganography system.

UNIT – I

Introduction: Applications and Properties, Models of Watermarking – Notation, Communications, Communication based Models of Watermarking, Geometric Models of Watermarking, Modeling Watermark Detection by Correlation.

UNIT – II

Basic Message Coding, Watermarking with Side Information: Informed Embedding, Watermarking Using Side Information, Dirty-Paper Codes, Practical Dirty-Paper Codes.

UNIT – III

Analyzing Errors: False Positive and Negative Errors, ROC Curves, The Effect of Whitening on Error Rates, Analysis of Normalized Correlation, Using Perceptual Models- Evaluating Perceptual Impact of Watermarks, General Form of a Perceptual Model - Examples, Perceptually Adaptive Watermarking.

UNIT – IV

Robust Watermarking: Approaches, Robustness to Volumetric Distortions, Robustness to Temporal and Geometric Distortions, Watermark Security- Security Requirements, Watermark Security and Cryptography, Some Significant Known Attacks, Content Authentication- Exact Authentication, Selective Authentication, Localization, Restoration.

UNIT – V

Steganography: Steganographic Communication, Notation and Terminology, Information-Theoretic Foundations of Steganography, Practical Steganographic Methods, Minimizing the Embedding Impact,Steganalysis-Steganalysis Scenarios, Steganalysis Algorithms.

Suggested Reading:

1) Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", 2nd Edition, Morgan Kaufmann, 2007.
2) Michael T. Raggo and Chet Hosmer, "Data Hiding: Exposing Concealed Data in Multimedia, Operating Systems, Mobile Devices and Network Protocols", 1st Edition, Syngress, 2012.

IT 6112

ELECTRONIC COMMERCE

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. To understand the concept of e-Commerce;
2. To understand the applications of e-Commerce;
3. To understand the security issues of e-Commerce
4. To understand the role of multimedia in e-Commerce

Course outcomes:

Upon successful completion of the course students can

1. Able to use e-commerce in business applications
2. To resolve security issues in Electronic Payment Systems
3. To make effective use of multimedia in E-commerce applications

UNIT-I

Electronic Commerce: Electronic Commerce Frame Work, Electronic Commerce and Media Convergence, Anatomy of E-Commerce appellations, Electronic Commerce Consumer applications, Electronic Commerce Organization Applications.

Consumer Oriented Electronic Commerce: Consumer- Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer's Perspective, Mercantile Models from the Merchants' Perspective.

UNIT-II

Electronic Payment systems: Types of Electronic Payment Systems, Digital Token - Based Electronic Payment Systems, Smart Cards Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment systems, Designing Electronic Payment Systems.

UNIT -III

I**nter Organizational Commerce and EDI:** Electronic Data Interchange, EDI applications in business, EDI: Legal, Security, and Privacy issues, EDI and Electronic Commerce. EDI Implementation, MIME and Value added networks.-Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value-Added Networks, Internet-Based EDI.

Intra organizational Electronic Commerce: Internal Information Systems, Work Flow Automation and Coordination, Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library: Dimensions of Internal electronic Commerce Systems, Types of Digital Documents, Issues behind Document Infrastructure, Corporate Data Warehouse Advertising and Marketing on the Internet - Information based marketing, advertising on Internet, on-line marketing process, market research.

UNIT -V

Consumer Search and Resource Discovery: Search and Resource Discovery paradigms, Information search and Retrieval, Electronic Commerce catalogues or Directories, information filtering, Consumer-Data Interface, Emerging Tools.

Multimedia and Digital video: key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop video conferencing.

Suggested Reading:

1) Ravi Kalakota& A. B. Whinstong: "Frontiers of Electronic Commerce", Pearson Education, lndia, 2006.
2) Daniel Minoli, Emma Minoli, “Web Commerce Technology Handbook” Tata McGraw Hill 2007.
3) J Christopher W, Theodore HKC, "Global Electronic Commerce: Theory and Case Studies", Universities Press, 2001.

IT 6113

SOFT COMPUTING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. understand the evolution of soft computing
2. learn the basics of genetic algorithms
3. learn the concepts related to fuzzy logic
4. appreciate the power of neural networks

Course outcomes:

Upon successful completion of the course students can

1. Apply the principles of computation intelligence in addressing real world scenarios
2. Design and implement neural networks
3. Develop fuzzy inference systems

UNIT-I

Introduction to Soft Computing and Neural Networks: Evolution of Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics.

UNIT - II

Genetic Algorithms: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning, Machine, Learning Approach to Knowledge Acquisition.

UNIT- III

Neural Networks: Machine Learning Using Neural Network. Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks, Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks.

UNIT- IV

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT - V

Neuro-Fuzzy Modeling: Adaptive Neuro, Fuzzy Inference Systems, Coactive Neuro, Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification, Neuro, Fuzzy Control, Case studies.

Suggested Reading:

1) Iyh, Shlng Roger Jang, Chuen,Tsai Sun, EijiMizutani, "Neuro, Fuzzy and Soft Computing ", Prentice, Hall of India, 2003.
2) George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic, Theory and Applications ", Prentice Hall 1995.
3) James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
4) Mitchell Melanie, "An Introduction to Genetic Algorithm ", Prentice Hall, 1998.
5) David E. Goldberg, "Genetic Algorithms in Search. Optimization and Machine Learning ", Addison Wesley, 1997.

IT 6114

DATA MINING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. To introduce the basic concepts of Data Mining.
2. Discover interesting patterns in corpus of data available using various techniques.
3. Analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

Course Outcomes:

Students who complete this course should be able to

1. Preprocess the raw data to make it suitable for various data mining algorithms.
2. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

UNIT-I

Introduction: Challenges, Origins of Data Mining and Data Mining Tasks.

Data: Types of Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity, OLAP and Multidimensional Data Analysis.

UNIT-II

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction-Model Over fitting, Evaluating the Performance of a Classifier, Methods of Comparing Classifiers, Rule-Based Classifier.

UNIT-III

Classification: Nearest-Neighbor classifiers, Bayesian Classifiers, Artificial Neutral Networks, Support Vector Machine, Ensemble Methods, Class Imbalance Problem, Multiclass Problem.

UNIT-IV

Association Analysis: Problem Definition, Frequent Item Set Generation, Rule Generation, Compact Representation of Frequent Item Sets, Alternative Methods for Generating Frequent Item Sets, FP-Growth Algorithm, Evaluation of Association Patterns, Effect of Skewed Support Distribution, Handling Categorical Attributes a Handling Continuous Attributes, Handling a concept Hierarchy.

UNIT-V

Cluster Analysis: Overview, K-means, Agglomerative Hierarchical Clustering, DBSCAN Cluster Evaluation on Characteristics of Data, Clusters and Clustering Algorithms.

Suggested Reading:

1) Pang-Ning Tan. Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008.
2) Han J &Kamber M, Data Mining: Concepts and Techniques, Third Edition, Elsiver, 2011
3) Arun K Pujari, "Data Mining Techniques ", University Press. 2nd Edn, 2009.
4) VikrarnPudi, P. Radha Krishna, "Data Mining", Oxford University Press, 1st edition, 2009.
5) Sumathi, S N Sivanandam, "Introduction to Data Mining and its Applications ", Springer.

IT 6115

GRIDCOMPUI1NG

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. understand basics of Grid computing
2. understand the security issues related to grid computing system
3. understand web and grid services

Course outcomes:

Upon successful completion of the course students can

1. design a grid computing system
2. resolve security issues in a grid computing system
3. apply web services in grid computing environment

UNIT-I

Introduction to Grid Computing: Grid Computing Concept, History of Distributed Computing Computational Grid Applications, Grid Computing Infrastructure Development, Grid Computing Software Interface Job Submission: Introduction, Globus Job Submission, Transferring Files.

UNIT-II

Schedulers: Scheduler Features, Scheduler Examples, Grid Computing Meta-Schedulers, Distributed Resource Management Application (DRMAA).

Security Concepts: Introduction, Symmetric Key Cryptography, Asymmetric Key Cryptography, (Public Key Cryptography), Public Key Infrastructure, Systems/Protocols Using Security Mechanisms.

Grid Security: Introduction, Grid Security Infrastructure (GSI), Delegation, Higher-Level Authorization Tools.

UNIT-III

System Infrastructure I: Web Services: Service-Oriented Architecture, Web Services and Web Service Implementation.

System Infrastructure II: Grid Computing Services: Grid Computing and Standardization Bodies, Interacting Grid Computing Components, Open Grid Services Architecture (OGSA), WSRF.

User-Friendly Interfaces: Introduction Grid Computing Workflow Editors, Grid Portals.

UNIT-IV

Grid-Enabling Applications: Introduction, Parameter Sweep, Using an Existing Program on Multiple Grid Computers, Writing an Application Specifically for a Grid, Using Multiple Grid Computers to Solve a Single Problem.

UNIT-V

Case Studies:

Globus: Overview of Globus Toolkit 4, Installation of Globus, GT4 Configuration, Main Components and programming Model, Using Globus.

gLite: Introduction, Internal Workings of gLite, Logging and Bookkeeping (LB), Security Mechanism Using gLite.

Resource management using Gridway and Gridbus.

Scheduling using Condor, SGE, PBS, LSF Grid scheduling with QoS.

Suggested Reading:

1) Barry Wilkinson, "Grid Computing Techniques and Applications", CRC Press, 2010.
2) Frederic Magoules, Jie Pan, Kiat-An Tan, Abhinit Kumar, “Introduction to Grid Computing” CRC Press, 2009.
3) Vladimir Silva, "Grid Computing for Developers ", Dreamtech Press, 2006.
4) Ian Foster, Carl Kesselman. "The Grid 2- Blueprint for a new computing Infrastructure". Elsevier Series, 2004.
5) Fran Berman, Geoffrey Fox. Anthony J.G Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003.
6) Joshey Joseph, Craig Fellenstein, "Grid computing", IBM Press, 2004.

IT 6116

SEMANTIC WEB

Instruction	3. Periods per week
Duration	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

At the end of the course, student should be able to

1. Learn features, rationale, and advantages of Semantic Web technology.
2. learn essentials of XML and Ontology
3. understand data integration, data exchange, knowledge management, e-learning, and web services

Course outcomes:

Upon successful completion of the course students can

1. able to represent the knowledge related to various applications using RDF schemas
2. develop semantic models, ontologies and inference systems.

UNIT- I

The Future of the Internet: Introduction, Syntactic Web, Semantic Web, Working of Semantic Web, What is not a Semantic Web, Side Effects.

Ontology: Definitions, Taxonomies, Thesauri and Ontologies, Classifying Ontologies, Web Ontology Description language, Ontologies-Categories-Intelligence .

UNIT- II

Knowledge Description in Description Logic: Introduction, Example, Family of Attributive Languages, Inference problems.

RDF and RDF Schema: Introduction, XML Essentials, RDF, RDF Schema.

UNIT- III

OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Properties, Classes, Individuals, Data types

Rule Languages: Introduction, Usage Scenarios, Datalog, RuleML, SWRL, TRIPLE.

UNIT- V

Semantic Web Services: Introduction, Web Service Essentials, OWL-S Service Ontology, OWL-S Example.

Methods for Ontology Development: Introduction, Uschold and King Ontology Development Method, Toronto Virtual Enterprise Method, Methontology, KACTUS Project Ontology Development Method, Lexicon-Based Ontology Development Method, Simplified Methods.

UNIT- V

Ontology Sources: Introduction, Metadata, Upper Ontologies

Software Agents: Introduction, Agent Forms, Agent Architecture, Agents in the Semantic Web Context.

Applications: Introduction, Horizontal Information Products, Open academia, Bibster, Data Integration, Skill Finding, Think Tank Portal, e-learning, Web Services.

Suggested Reading:

1) Karin K Brietman, Marco Antonio Casanova, Walter Truszkowski, "Semantic Web – Concepts", Technologies and Applications, Springer 2007.
2) Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", PHI 2008.
3) Liyang Yu, "Semantic Web and Semantic Web Services", CRC 2007.

IT 6117

MOBILE ADHOC AND SENSOR NETWORKS

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

CourseObjectives:

At the end of the course, student should be able to

1. To understand the concepts of wireless LANs, PAN, mobile adhoc networks and sensor networks
2. To understand the components of mobile IP and mobility management.
3. To understand proactive, reactive and hybrid classes of routing approaches

Course Outcomes:

After successful completion of the course, student will be able to

1. Identify layers of Wi-Fi, Bluetooth and their functions
2. Describe the principles of mobile adhoc networks and explain how the 3 classes of routing protocols function
3. Identify the components and the role of each component of wireless sensor networks

UNIT - I

Introduction- Issues in Mobile computing, Overview of wireless telephony: Cellular concept, GSM, System Architecture, Protocols, Connection Establishment, Frequency Allocation, Routing, Handover, Security, GPRS.

Wireless LAN – IEEE 802.11 Standards, Architecture, services, HIPERLAN, AdHoc Network, Blue Tooth.

UNIT - II

Mobile IP – Dynamic Host Configuration Protocol, Routing : DSDV, DSR, AODV, ZRP, TCP over Wireless Networks: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit /Fast Recovery, Transmission/Timeout Freezing, SelectiveRetransmission, Transaction Oriented TCP

WAP: WAP Architecture, WDP, WTLS, WTP, WSP, WML, WML Script, WAE, WTA.

UNIT - III

Introduction to Ad-hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANETs.

Routing in MANETs: Criteria for classification, Table Driven Routing Protocols, Source Initiated On-Demand Routing Protocols, Hybrid Protocols – Zone Routing, Fisheye Routing, LANMAR for MANET with group mobility, Location Added Routing, Distance Routing Effects, Micro discovery and Power Aware Routing.

UNIT - IV

Data Transmission: Broadcast storm problem, Broadcasting.

Multicasting and Geocasting - TCP over Ad-Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc networks.

QoS Issues in Ad-hoc Networks: QoS parameters in Ad-hoc networks, Issues and challenges in providing QoS in Ad-hoc Wireless networks, Classification of QoS solutions, MAC layer and Network Layer solutions.

UNIT - V

Basics of Sensors and Applications: Architecture of wireless sensor networks, Mica mote, sensing and communication range, design issues, energy consumption, classification of wireless sensor networks, Routing layer, Transport layer, High-level application layer support.

Suggested Reading:

1) Jochen Schiller, "Mobile Communications", Second Edition, Prentice Hall of India, Pearson Education, 2003.
2) William Stallings, "Wireless Communications and Networks", Second Edition, Prentice Hall of India, Pearson Education, 2004.
3) UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
4) PrasantMohapatra and Srihanamurthy, "Ad-Hoc Networks Technologies and Protocols", Springer, Springer International Edition, 2009.
5) Siva Ram Murthy and B. S. Manoj, "Ad-Hoc Wireless Networks: Architectures and Protocols", Pearson Education, Inc., 2005.
6) KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks", A John Wiley & Sons, Inc., Publication, 2007.
7) Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.
8) Feng ZHAO. Leonidas GUIBAS, "Wireless Sensor Network-An Information Processing Approach", Morgan Kaufmann Publishers, Elsevier.

IT 6118

STORAGE MANAGEMENT

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

CourseObjectives:

At the end of the course, student should be able to

Course Objectives:

1. To define backup, recovery, disaster recovery, business continuity, and replication
2. To understand logical and physical components of a storage infrastructure
3. To identify components of managing and monitoring the data center
4. To define information security and identify different storage virtualization technologies

Course Outcomes:

At the end of the course, student will be able to

1. Identify key challenges in managing information and analyze different storage networking technologies and virtualization
2. Understand components and the implementation of Network Attached Storage
3. Understand CAS architecture and types of archives and forms of virtualization

UNIT-I

Introduction to Information Storage and Management
Storage System Environment
Intelligent Storage System

UNIT-II

Direct-Attached Storage and Introduction to SCSI
Storage Area Networks
Network-Attached Storage

UNIT-III

IP SAN
Content -Addressed Storage
Storage Virtualization

UNIT-IV

Introduction to Business Continuity
Backup and Recovery
Local Replication

UNIT-V

Remote Replication
Securing the Storage Infrastructure
Managing the Storage Infrastructure

Suggested Reading:

1) G. Somasundaram, AlokShrivastava, "Information Storage and Management", Wiley Publishing Inc., 2009.
2) Raplh H. Thornburgh, Burry J Schoenborn, "Storage Area Networks ", Prentice-Hall, 2000.

IT 6121

CLOUD COMPUTING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

CourseObjectives:

At the end of the course, student should be able to

1. Understand cloud computing technologies, such as Infrastructure as a Service, Platform as a Service and Software as a Service
2. Understand different virtualization technologies
3. Understand security issues in cloud

Course Outcomes:

After successful completion of the course, student will be able to

1. configure Operating system level virtualization
2. develop applications using Google app engine
3. design a new security model for the cloud environment

UNIT-I

Introduction to Cloud Computing:Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT-II

Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

Case Studies : Xen Virtual machine monitors – Xen API. VMware – Vmware products – Vmware features. Microsoft Virtual Server – Features of Microsoft Virtual Server.

UNIT-III

Cloud Computingarchitectures over Virtualized Data Centers: Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT-IV

Cloud Security and Trust Management, data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb:Onion

Encryption layers – DET, RND, OPE, JOIN, SEARCH, HOM and Holomorphic Encryption, FPE. Trust, Reputation and Security Management.

Unit-V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWs and Microsoft Azure, Emerging Cloud Software Environments.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers,Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Suggested Reading:

1. John W. Rittenhouse, James F. Ransome, "Cloud Computing: Implementation, Management, and Security ", CRC Press 2009.
2. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.
3. RajkumarBuyya, James Broberg and Andrzej M. Goscinski,"Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley *Publishing* ©2011
4. Raluca Ada Popa, Catherine M.S.Redfield, NickolaiZeldovich and HariBalakrishnana, "CryptDB:Protecting Confidentiality with encrypted Query Processing" 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
5. A Fully Homomorphic Encryption Scheme, Craig Gentry September 2009.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

IT 6122

BIOMETRIC SECURITY

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Objectives:

1. To provide students with understanding of biometrics, biometric equipment and standards applied to security.
2. To introduce biometric computing knowledge and methods
3. To learn some basic biometrics systems with real case studies

Outcomes:

After the course is completed student should be able to:

1. Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
2. Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
3. Identify various issues associated with the design and implementation of biometric systems.

UNIT - I

Introduction: Person Recognition, Biometric Systems, Biometric Functionalities, Biometric System Errors, The Design Cycle of Biometric Systems, Applications, Security and Privacy Issues.

UNIT - II

Fingerprint recognition: Introduction, Friction Ridge Pattern, Fingerprint Acquisition, Feature Extraction, Matching, Fingerprint Indexing, Fingerprint Synthesis, Palmprint.

Face Recognition: Introduction, Image Acquisition, Face Detection, Feature Extraction and Matching.

UNIT - III

Iris Recognition: Introduction, Design of an Iris Recognition System, Image Acquisition, Iris Segmentation, Iris Normalization, Iris Encoding and Matching, Iris Quality, Performance Evaluation.

UNIT - IV

Additional Biometric Traits: Introduction, Ear, Gait, Hand Geometry, Soft Biometrics.

Multibiometrics: Introduction, Sources of Multiple Evidence, Acquisition and Processing Architecture Fusion Levels.

UNIT- V

Security of Biometric Systems: Introduction, Adversary Attacks, Attacks at the User Interface, Attacks on Biometric Processing, Attacks on the Template Database.

Suggested Reading:

1) Anil K. Jain, Arun A. Ross,KarthikNandakumar, "Introduction to Biometrics", Springer Science Business Media, LLC 2011.
2) James Wayman, Anil Jain, DavideMaltoni, and Dario Maio (Eds) "Biometric Systems
3) Technology, Design and Performance Evaluation",Springer-Verlag London Limited 2005.
4) Julian Ashbourn,"Guide to Biometrics for Large-Scale Systems Technological, Operational,
5) and User-Related Factors" Springer-Verlag London Limited 2011.
6) "Securing Biometrics Applications"by Charles A. Shoniregun and Stephen Crosier Springer.

IT 6123

FORENSIC COMPUTING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

CourseObjectives:

At the end of the course, student should be able to

1. understand the fundamentals of computer forensics
2. learn the detailed internals of a modern PC
3. understand file systems and disk geometry

Course Outcomes:

After successful completion of the course, student will be able to

1. apply science and engineering to the legal problem for acquiring digital evidence
2. analysedifferent file systems to recover digital evidence
3. identify and organize major characteristics of personal electronic devices like PDA's,etc

UNIT - I

Understanding Information: Binary Systems and Memory, Addressing, Number Systems, Characters, Computer Programs, Records and Files, File Types and Signatures, Use of Hexadecimal Listings, Word Processing Formats, Magic Numbers, Graphic Formats, Archive Formats, Applications.

UNIT - II

IT Systems Concepts: Two Black Boxes, Program, Data, Rules and Objects, Patterns Can Mean Whatever We Choose Them to Mean, Software Development, Breaking Sequence, An Information Processing System.

PC Hardware and Inside the Box : The Black Box Model, The Buses and the Motherboard, Intel Processors and the Design of the PC, A Few Words about Memory, Backing Store Devices, Floppy Disk Drive Units, External Peripherals, Expansion Cards.

UNIT - III

Disk Geometry: A Little Bit of History, Five Main Issues, Physical Construction of the Unit Formation of Addressable Elements, Encoding Methods and Formats for Floppy Disks, Construction of Hard Disk Systems, Encoding Methods and Formats for Hard Disks, The Formatting Process, Hard Disk Interfaces, IDE/ATA Problems and Workarounds, Fast Drives and Big Drives, Serial ATA(SATA), The POST/Boot Sequence, A Word About Other Systems, The Master Boot Record and Partitions, FATs, Directories and File Systems, RAID.

UNIT - IV

The New Technology File System: A Brief History, NTFS Features, NTFS – How it Works, The MFT in Detail, Analysis of a Sample MFT File Record with Resident Data, Analysis of a Sample MFT File Record with Non-Resident Data, Dealing with Directories, Analysis of a Sample MFT Directory Record with Resident Data, External Directory Listings – Creation of "INDX" Files, Analysis of an "INDX" File.

The Treatment of PCs: The ACPO *Good Practice Guide*, Search and Seizure, Computer Examination – Initial Steps, Imaging and Copying.

UNIT - V

The Treatment of Electronic Organizers: Electronic Organizers, Application of the ACPO *Good Practice Guide* Principles, Examination of Organizers and what may be Possible, JTAG Boundary Scan, A Few Final Words about Electronic Organizers.

Looking A head: Bigger and Bigger Disks, Live System Analysis, Networked Systems Add to the Problems, Encryption, A Final Word.

Suggested Reading:

1) Sammes T, B. Jenkinson, "Forensic Computing", Springer, 2007.
2) Eoghan Casey, Ed. "Handbook of Digital Forensics and Investigation", Academic Press, 2010.

IT 6124

SOFTWARE QUALITY AND TESTING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives

At the end of the course, student

1. learns the importance of software quality assurance.
2. gets knowledge about Quality tools in the Software development process.
3. gains an insight to Software Testing.

Course outcomes

Upon successful completion of the course

1. Gained Knowledge about Software Quality assurance.
2. Students got acquainted with various Quality tools.
3. Gained knowledge about Software Testing.

UNIT-I

Software Quality, Quality Management, Software Quality Metrics, Product Quality Metrics, In Process Quality Maintenance, Examples.

UNIT-II

Quality Too1s in Software Development, Seven Basic Tools, Check List, Pareto Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause and Effect Diagram, Defect Removal, Effect Removal Effectiveness, Quality Planning, Cost Effectiveness of Phase Effect Removal.

UNIT-III

Software Testing Background, Software Development Process, Realities of Software Testing, Examining the Specification, Testing the s/w with Blinders on Examining the Code, Testing the s/ w with X-ray.

UNIT-IV

Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Website Testing, Automated Testing and Test Tools Bug Bashes & Beta Testing.

UNIT-V

Planning Your Test Effort, Writing & Tracking Test Cases, Reporting Measuring SQA.

Suggested Reading:

1) Stepen. H. Khan, "Metrics and Models in Software Quality Engineering", Pearson Education. India, 1995.
2) Ron Patton, "Software Testing", Sams Publishing, 2001.
3) Boris Beizzer, "Software Testing Techniques" Sams Publishing, 2001.
4) Allan Gilles, "Software Quality Theory & Management", Thomson International Press, 1997.

IT 6125

SIMULATION AND MODELING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives

At the end of the course, student will be able to

1. Understand the basic system conceptsand techniques to simulate various systems;
2. Understand various random theories and variate

Course Outcomes

Upon completion of the subject, students will be able to

1. analyse input and output data using tests such as chi-square, turning test, etc.
2. develop applications for statistical analysis using GPSS, SIMAN, etc

UNIT-I

Introduction to simulation: Advantages and Disadvantages of simulation - Areas of applications, Systems and system environment, Concept of a System, Discrete and continuous systems – Models, Types of models, Steps in a simulation study – examples, Discrete - event system simulation.

UNIT-II

Overview of Statistical Models and Queuing Systems, Programming languages for Simulation: Continuous and Discrete Simulation Languages – FORTRAN, GPSS, SIMAN, SIMSCRIPT, SLAM and MODSIM.

UNIT-III

Random Numbers: Generation, Properties of Random Numbers, Generation of Pseudo Random Numbers, Tests for Random Numbers.

Random variate: Generation, Inverse Transformation Technique, Uniform Distribution, Exponential Distribution, Weibul's Distribution, Triangular Distribution, Empirical Continuous Distributions, Discrete Distributions, Direct Transformation for the Normal Distribution, Convolution. Method of Erlang Distribution, Acceptance Rejection Techniques: Poisson Distribution, Gamma Distribution.

UNIT-IV

Input data analysis: Data collection: Identify the Distribution, Parameter & Estimation. **Goodness of fit tests:** Chi Square Test - KS test, Multivariate and time series input models, Verification and Validations of simulation models, Model Building.

Verification and Validation: Verification of Simulation Models, Calibration and Validation of Models Face Validity, Validation of Model Assumptions, Validation input/output Transformations, Input/output Validation using Historical input data, Input/output validation sing Turning test.

UNIT-V

Output Data Analysis: Stochastic, Nature of Output Data, Types of Simulation with respect to Output Analysis, Measures of Performance and their Estimation. Output Analysis for Terminating Simulations, Output analysis for Steady - State Simulations.

Comparison and Evaluation of Alternative system Designs: Comparison of several System Designs, Statistical Models for Estimating the Effect of Design Alternatives.

Suggested Reading:

1) Jerry Banks, John S. Carson and Barry L. Nelson, David M Nicol, "Discrete - Event System Simulation ", 5th Edition, Pearson Education.
2) NarsingDeo, "System Simulation with Digital Computer", Prentice Hall of India, 1979.
3) Anerill M. Law and W. David Kelton, "Simulation Modelling and Analysis ", McGraw Hill, 2001.
4) Nandini Prasad K.S, Dinakar K. S, " Introduction to System Modelling& Simulation", FILLIP Learning, Elsevier.

IT 6126

DIGITAL IMAGE PROCESSING AND COMPUTER VISION

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives:

1. To learn the fundamental concepts and applications of digital image processing.
2. To learn the image processing concepts: Intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, Image restoration and reconstruction, Color image processing, Image compression.
3. To learn the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.

Course Outcomes:

Students who complete this course should be able to

1. Implement Pre and Post process for the given image using image enhancement techniques.
2. Design and Implement digital image processing related problems as part of mini projects.
3. Implement Color image processing and Image compression methods.

UNIT-I

Basics: Introduction, Fundamental steps, Components. Elements of visual perception, image sampling and quantization, some basic relationships between pixels.

Intensity Transformations: Some Basic Intensity Transformation Functions, Histogram Processing

UNIT- II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

Filtering in the Frequency Domain: Preliminary Concepts, Image Smoothing using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

UNIT- III

Image Restoration and Reconstruction: A Model of the Image degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only—Spatial Filtering, Minimum Mean Square Error (Wiener) Filtering

Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing

UNIT- IV

Image Segmentation: Fundamentals, Point, Line, and Edge Detection, Segmentation by Thresholding, Region-Based Segmentation, Segmentation Using Watershed Algorithm.

Representation and Description: Representation, Some Simple Descriptors, Shape Numbers, Fourier Descriptors.

Object Recognition: Patterns and Pattern Classes, Matching: Minimum distance classifier, correlation.

UNIT-V

Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing.

Image Compression: Fundamentals, Compression Techniques, Lossless Compression, Lossy Compression, Measuring Information, Lossless Compression, Huffman Encoding, Arithmetic Coding, LZW, Run Length, Predictive Coding.

Suggested Reading:

1) Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 3nd Edition, 2008.
2) Vipula Singh, "Digital Image Processing with MatLab and lab View", Elsevier
3) Thomas B. Moeslund, "Introduction to Video and Image Processing: Building Real Systems and Applications",Springer, 2012.
4) Milan Sonka, Vaclav Halvac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", Second Edition, Thomson Learning Publishers.
5) Kenneth R.Castleman, "Digital Image Processing", Pearson Education.

IT 6127

WEB MINING

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Objectives:

1. Introduce students to the basic concepts and techniques of Information Retrieval, Web Search, Machine Learning for extracting knowledge from the web.
2. Develop skills of using recent data mining software for solving practical problems of Web Mining.
3. Gain experience of doing independent study and research.

Outcomes:

After the course is completed student should be able to:

1. Describe key concepts such as web log, hypertext, social network, information synthesis, corpora and evaluation measures such as precision and recall.
2. Discuss the use of methods and techniques such as word frequency and co-occurrence statistics, normalization of data, machine learning, clustering and vector space models.
3. Analyze and explain what web mining problems are satisfiably solved, what is worked upon at the research frontier and what still lies beyond the current state-of-the-art.

UNIT-I

Introduction: Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink analysis, Resource Discovery and Vertical Portals. Structured vs Unstructured Data Mining.**Crawling the web:** HTML and HTTP basics, Crawling Basics, Engineering Large Scale Crawlers, Putting Together a Crawler.

UNIT-II

Web Search and Information Retrieval: Boolean Queries and Inverted index, Relevance Ranking, Similarity Search.

Similarity and Clustering: Foundations and Approaches, Bottom-up and Top-Down partitioning paradigms.

UNIT-III

Supervised learning: Introduction, Overview of classification strategies, Nearest Neighbor Learners, Feature Selection, Bayesian Learners, Discriminative Classification, Hypertext Classification.

UNIT-IV

Semi supervised learning: Expectation Maximization, Labelling Hypertext Graphs, Co-Training

Social network analysis: Social Sciences and bibliometry, Page Rank and HITS, Coarse Grained Graph, Model, EnhancedModel and Techniques, Evaluation of Topic Distillation.

UNIT-V

Resource discovery: Collecting Important Pages, Similarity Search using Link Topology, Topical Locality and Focused Crawling, Discovering Communities.

Future of Web Mining: Information Extraction, Natural Language Processing, Question Answering, Profile, Personalization and Collaboration.

Suggested Reading:

1) ChakrabartiSoumen, "Mining the Web: Discovering Knowledge from Hypertext Data ", Morgan Kaufmann Publishers, 2003.
2) Manu Konchady, "Text Mining Application Programming" Cengage Learning, 2006.

IT 6128

SOFTWARE PROJECT MANAGEMENT

Instruction	3 Periods per Week
Duration of University Examination	3 Hours
University Examination	80 Marks
Sessional	20 Marks

Course objectives

At the end of the course, student

1. Gets basic knowledge of software project management principles
2. Choose an appropriate project development methodology (e.g. waterfall, spiral …)
3. Learn resource management in successful completion of a project

Course outcomes

Upon successful completion of the course student will be able to

1. Design a project schedule and assign resources
2. work in a team environment and be aware of different modes of communications
3. Identify project risks, monitor and track project deadlines

UNIT-I

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, Old Way & New.

UNIT-II

Life - Cycle Phases, Artifacts of the Process, Model Based Software Architectures, Workflows of the Process, Checkpoints of the process.

UNIT-III

Iterative Process Planning, Project Organization & Responsibilities, Process Automation, Project Control and Process Instrumentation, Tailoring the Process.

UNIT-IV

Modern Project Profiles, Next Generation Software Economics, Modern Process Transitions, Managing Contacts, Managing People & Organizing Teams.

UNIT-V

Process Improvement & Managing to the CMM, ISO 12207- an Overview, Programme Management.

Suggested Reading:

1) Walker Royce, "Software Project Management - A Unified frame work", Pearson Education, Addision.
2) Bob Hughes, MilkeCotterell- "Software Project Management", Tata McGraw Hill, 3rd Edition.
3) Watt S. Humphery, "Managing Software Process", Addison - Wesley, 1998.

IT 5141

SOFTWARE LAB- II
(ADVANCED ALGORITHMS, DATABASE SECURITY)

Instruction	3 Periods per Week
Duration of University Examination	--
University Examination	--
Sessional	50 Marks

1. Implementation of Shortest Path
2. Implementation of Minimal Spanning Tree
3. Implementation of String and Pattern Matching
4. Implementation of Network Flow
5. Implementation of Prim’s Algorithm
6. Implementation of Kruskal’s Algorithm
7. Implementation of Dijkstra's Algorithm
8. Implementation of Database Insider Threat Mitigation
9. Implementation of Damage Assessment and Data Recovery from Information Attacks
10. Implementation of Database Intrusion Detection
11. Implementation of Data Provenance and Trust Models
12. Implementation of Data Security Models
13. Implementation of Secure Transaction Management and Query Processing

IT 5142

SEMINAR – II

Instruction	3 Periods per Week
Duration of University Examination	--
University Examination	--
Sessional	50 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his / her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members. Students are to be exposed to following aspects of Seminar presentations.

Literature Survey
Organization of material
Preparation of PowerPoint presentation slides
Technical Writing

Each Student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board
2. Give 20 minutes of PowerPoint presentation followed by 10 minutes of discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and written presentation in addition to their involvement in the discussion.