R18

M.Tech. (COMPUTER NETWORKS & INFORMATION SECURITY)

M.Tech. R18 CBCS Curriculum

VISION OF THE INSTITUTE

To be a World Class University providing value-based education, conducting interdisciplinary research in cutting edge technologies leading to sustainable development of the nation

MISSION OF THE INSTITUTE

➢ To produce technically competent and socially responsible engineers, managers and entrepreneurs, who will be future ready.

➢ To involve students and faculty in innovative research projects linked with industry, academic and research institutions in India and abroad.

➢ To use modern pedagogy for improving the teaching-learning process.

DEPARTMENT OF

INFORMATION TECHNOLOGY

VISION OF THE DEPARTMENT

To impart quality technical education that fosters critical thinking, dynamism and innovation to transform students into globally competitive IT professionals.

MISSION OF THE DEPARTMENT

➢ To provide quality education through innovative teaching and learning process that yields advancements in state-of-the-art information technology.

➢ To provide a learning environment that promotes quality research.

➢ To inculcate the spirit of ethical values contributing to the welfare of the society.

M.TECH.

(COMPUTER NETWORKS & INFORMATION SECURITY)

M.TECH. (CNIS)

PROGRAM EDUCATIONAL OBJECTIVES

PEO-I: Apply the necessary mathematical tools and fundamental & advanced knowledge of computer Science & engineering and computer networks

PEO-II: Develop computer network & security systems understanding the importance of Social, Business, Technical, Environmental, and human context in which the systems would work

PEO-III: Articulate fundamental concepts, design underpinnings of network & security systems, and research findings to train professionals or to educate post engineering students

PEO-IV: Contribute effectively as a team member/leader, using common tools and environment, in computer networks & security projects, research, or education

PEO-V: Pursue life-long learning and research in computer networks and contribute to the growth of that Field and society at large

M.TECH. (CNIS)

PROGRAM OUTCOMES

PO-1: Scholarship of knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the conceptualization of Network & security models.

PO-2: Critical thinking: Identify, formulate, research literature and solve complex Network & security problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO-3: Problem solving: Design solutions for complex real time problems and design systems, components or processes that meet specified needs with appropriate consideration for Network & security

PO-4: Research skill: Conduct investigations of complex Network & security problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO-5: Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

PO-6: Collaborative and multidisciplinary work: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO-7: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-8: Independent and reflective learning: Demonstrate a knowledge and understanding of management and business practices, such as risk and change management, and understand their limitations.

PO-9: Ethical practices and social responsibility: Understand and commit to professional ethics and responsibilities and norms of engineering practice. Understand the impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development.

PO-10: Project management: Ability to undertake problem identification, formulation and providing optimum solution

PO-11: Lifelong learning: Recognize the need for, and have the ability to engage in independent and life-long learning.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER NETWORKS & INFORMATION SECURITY)

I SEMESTER   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-I	18PC1CN01	Principles of Information Security	3	0	0	3
Professional Core-II	18PC1CN02	Advanced Computer Networks	3	0	0	3
Professional Core-III	18PC1CN03	Data Structures and Algorithms	3	0	0	3
Professional Elective-I	18PE1CN01	Computer Forensics and Cyber Security	3	0	0	3
	18PE1CN02	Machine Learning and Security				
	18PE1CN03	Cloud Based Computing				
Professional Elective -II	18PE1CN04	Distributed Systems	3	0	0	3
	18PE1CN05	Designing the Internet of Things				
	18PE1CN06	Security in E-Commerce				
Professional Core Lab-I	18PC2CN01	Information Security and Networks Laboratory	0	0	3	1.5
Professional Core Lab-II	18PC2CN02	Data Structures and Algorithms Laboratory	0	0	3	1.5
Project	18PW4CN01	Technical Seminar	0	0	4	2
Audit	18AU5CS01	Research Methodology and IPR	2	0	0	0
Total			**17**	**0**	**10**	**20**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER NETWORKS & INFORMATION SECURITY)

II SEMESTER   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-IV	18PC1CN04	Wireless Networks and Mobile Computing	3	0	0	3
Professional Core-V	18PC1CP05	Soft Computing	3	0	0	3
Professional Core-VI	18PC1CN05	Web Scripting Languages	3	0	0	3
Professional Elective-III	18PE1CN07	Fundamentals of Wireless Sensor Networks	3	0	0	3
	18PE1CN08	Intrusion Detection				
	18PE1CN09	Network Programming				
Professional Elective -IV	18PE1CN10	Ethical Hacking	3	0	0	3
	18PE1CN11	Security Assessment and Risk Analysis				
	18PE1CN12	Information Security Management and Standards				
Professional Core Lab-III	18PC2CN03	Wireless Networks Simulation and Soft Computing Laboratory	0	0	3	1.5
Professional Core Lab-IV	18PC2CN04	Web Scripting Languages Laboratory	0	0	3	1.5
Project	18PW4CN02	Mini-Project	0	0	4	2
Audit	18AU5EN01	English for Academic and Research Writing	2	0	0	0
Total			**17**	**0**	**10**	**20**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. II YEAR COURSE STRUCTURE AND SYLLABUS

(COMPUTER NETWORKS & INFORMATION SECURITY)

III SEMESTER   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Elective-V	18PE1SE10	Software Defined Networks	3	0	0	3
	18PE1CN13	Network Management Systems				
	18PE1CN14	Storage Area Networks				
Open Elective	18OE1CN01	Business Analytics	3	0	0	3
	18OE1AM01	Industrial Safety				
	18OE1AM02	Operations Research				
	18OE1AM03	Composite Materials				
	18OE1PS01	Waste to Energy				
Project	18PW4CN03	Project Part - I	0	0	16	8
		Total	**6**	**0**	**16**	**14**

IV SEMESTER   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Project	18PW4CN04	Project Part - II	0	0	28	14
		Total	**0**	**0**	**28**	**14**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CN01) PRINCIPLES OF INFORMATION SECURITY

COURSE OBJECTIVES:
- To understand the computer security concepts
- To differentiate symmetric / asymmetric cryptographic techniques
- To analyse various security mechanisms using cryptographic primitives
- To discriminate of security mechanism at various levels of computer networking and to be familiar with security defensive devices e.g., firewalls, intrusion detection etc.

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Remembering the overview of security principles
CO-2: Understanding of network security related issues and mitigating mechanisms
CO-3: Analyzing different malwares and security tools
CO-4: Evaluating networking and security skills to industrial need

UNIT-I:
Information Security: Introduction, History of Information security, What is Security, Security Goals, Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, CNSS Security Model, Components of Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems Development Life Cycle.

UNIT-II:
Cryptography: Concepts and Techniques, symmetric and asymmetric key cryptography, steganography. Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution

UNIT-III:
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange

UNIT-IV:
Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, HMAC, Digital signatures, X.509, Kerberos

UNIT-V:
Security at layers (Network, Transport, Application):IPsec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME

UNIT-VI:
Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls

TEXT BOOKS:
1. Principles of Information Security, Michael E. Whitman, Herbert J. Mattord, 4th Edition, Cengage Learning
2. Cryptography and Network Security, William Stallings, 4th Edition, Pearson Education
3. Cryptography and Network Security, Forouzan Mukhopadhyay, 2nd Edition, McGraw Hill

REFERENCES:

1. Cryptography and Network Security, C. K. Shyamala, N. Harini, T. R. Padmanabhan, 1st Edition, Wiley India
2. Network Security and Cryptography, Bernard Menezes, Cengage Learning
3. Cryptography and Network Security, Atul Kahate, 2nd Edition McGraw Hill
4. Principles of Computer Security, W. M. Arthur Conklin, Greg White, TMH
5. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011

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M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CN02) ADVANCED COMPUTER NETWORKS

COURSE OBJECTIVES:
- To analyze computer network architectures, protocols and interfaces
- To categorize and understand the OSI reference model and the Internet architecture network applications
- To relate the course and expose students to the concepts of traditional as well as modern day computer networks
- To estimate the key concepts and practices employed in modern computer networking

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Remembering networking issues and differentiating TCP/IP and 7-Layer OSI models
CO-2: Analyzing different routing protocols for various applications
CO-3: Evaluating various switching protocols
CO-4: Applying Optical Networks and Wavelength routing

UNIT-I:
Computer Networks and the Internet: History of Computer Networking and the Internet, Networking Devices, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones.
Networking Models: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing,

UNIT-II:
Routing and its Concepts: Structure of a Router, Basic Router Configuration, Building a Routing Table, Static Routing, Dynamic Routing – Distance Vector Routing Protocol (RIPv1, RIPv2, EIGRP),Link State Routing Protocols (OSPF).

UNIT-III:
LAN Switching:
Switching and its Concepts: Structure of a Switch, Basic Switch Configuration, Virtual LANs, (VLANs), VLAN Trunking Protocol (VTP), Inter-VLAN Routing. Spanning Tree Protocol (STP).

UNIT-IV:
Wide Area Networks (WANs): Introduction to WANs, Point-to-Point Protocol (PPP) concepts, Frame Relay concepts, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), IPv6.

UNIT-V:
Optical Networks: WDM, Wavelength routing, LightPaths/Lighttrails, Wavelength conversion and rerouting, Network Survivability and Provisioning, IP over DWDM, Next generation Optical Networks: Optical Circuit Switching, Optical Burst Switching, Optical Packet Switching

UNIT-VI:
Voice over IP (VOIP): VOIP protocols: overview of H323 and SIP(session initiation protocol). Overview of VOIP call flows, IVR calls

TEXT BOOKS:
1. TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGraw Hill, 2010
2. Routing Protocols & Concepts, Rick Graziani, Pearson Education
3. LAN Switching & Wireless, Wayne Lewis, Pearson Education

REFERENCES:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Fifth Edition, Pearson Education, 2012
2. Network Fundamentals, Mark Dye, Pearson Education
3. Accessing the WAN, Bob Vachon, Pearson Education
4. Emerging Optical Network Technologies, Krishna M. Sivalingham, Suresh Subramaniam Springer, 2004
5. Computer Networks: A Systems approach, Larry L. Peterson & Bruce S. Davie, Fifth Edition, Elsevier, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CN03) DATA STRUCTURES AND ALGORITHMS

COURSE OBJECTIVES:
- To analyze algorithms and know abstract data types
- To experiment and Discriminate stack, queue and their applications
- To illustrate, Evaluate Searching and sorting techniques in real-world scenarios
- To summarize the knowledge of graphs and trees and their applications

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding complexity of an algorithm
CO-2: Remembering fundamental knowledge of Data Structures in Real time scenarios
CO-3: Applying the techniques in Software Development Life cycle
CO-4: Analyzing various algorithms on graph /tree data structures, including finding the minimum spanning tree and shortest path, Encoding and Decoding

UNIT-I:
Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation- Big Oh, Omega and Theta notations, Complexity Analysis Examples.

UNIT-II:
Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, singly linked lists –insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists.

UNIT-III:
Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a MaxHeap, DeletionfromaMax Heap

UNIT-IV:
Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hash table. Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, comparison of sorting methods.

UNIT-V:
Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT , representations, recursive and non-recursive traversals, Threaded binary trees. Binary search tree ADT ,insertion, deletion and searching operations, Balanced search trees.

UNIT-VI:
Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs

TEXT BOOKS:
1. Data Structures, Algorithms and Applications in Java, S. Sahni, Universities Press
2. Data Structures and Algorithms in Java, Adam Drozdek, 3rd Edition, Cengage Learning
3. Data Structures and Algorithm Analysis in Java, M. A. Weiss, 2nd Edition, Addison-Wesley (Pearson Education)

REFERENCES:
1. Data Structures and Algorithms in Java, Michael T. Goodrich, 4th Edition, John Willey & Sons
2. Data Structures using C, Reema Thareja, Second Edition, Oxford University Press

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)
         L   **T/P**   **C**
         3   **0**   **3**
(18PE1CN01) COMPUTER FORENSICS AND CYBER SECURITY

COURSE OBJECTIVES:
- To Understand the Fundamentals of Computer Forensics
- To examine various forensic tools to process the crime and incident scenes
- To learn how to collect and preserve digital evidence that resides on computer storage devices
- To analyze how cyber-crimes take place and how these can be handled by LAW

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Applying appropriate skills and knowledge in solving computer forensics problems
CO-2: Analyzing various Computer forensic tools and their importance
CO-3: Understanding and applying new methods for collecting and preserving evidences
CO-4: Evaluating the knowledge gained to investigate cybercrimes

UNIT-I:
Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by computer Forensics Specialists.
Types of Computer Forensics Technology: Types of Military Computer Forensics Technology, Types of Law Enforcement – Computer Forensic Technology – Types of Business Computer Forensics Technology.

UNIT-II:
Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.
Current Computer Forensic Tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software.

UNIT-III:
Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options – Obstacles – Types of Evidence – The Rules of Evidence- Volatile Evidence- General Procedure – Collection and Archiving – Methods of Collection – Artifacts – Collection Steps – Controlling Contamination: The chain of Custody.
Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene – Computer Evidence Processing Steps – Legal Aspects of Collecting Preserving Computer Forensics Evidence.
Computer Image Verification and Authentication: Special Needs of Evidential Authentication – Practical Consideration – Practical Implementation.

UNIT-IV:
Introduction to Cyber Crime: Cybercrime Definition and Origins of the World, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, Cybercrime and the Indian ITA 2000, Global perspective on Cybercrimes.
Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack Vector, Cloud Computing.

UNIT-V:

Cyber Crime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges posed by Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organization, Organizational Measures for handling Mobile Devises—Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT-VI:

Introduction to Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.

TEXT BOOKS:

1. Computer Forensics, Computer Crime Investigation, John R. Vacca, Firewall Media, New Delhi
2. Computer Forensics and Investigations, Nelson, Phillips Enfinger Steuart, CENGAGE Learning
3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunit Belpure, Wiley

REFERENCES:

1. Forensic Compiling, A Tractitioneris Guide, Tony Sammes and Brain Jenkinson, Springer International Edition
2. Computer Evidence Collection & Presentation, Christopher L. T. Brown, Firewall Media
3. Software Forensics Collecting Evidence from the Scene of a Digital Crime, Robert M. Slade, TMH, 2005
4. Computer Security: Principles and Practice, William Stallings and Lawrie Brown, Prentice Hall, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN02) MACHINE LEARNING AND SECURITY

COURSE OBJECTIVES:
- To introduce basic concepts and techniques of mathematics for machine learning
- To discuss fundamentals of machine learning to build machine learning algorithms
- To give students knowledge about supervised & unsupervised learning for machine learning algorithms
- To understand the major topics in machine learning applied to security applications

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Identifying and describe mathematical techniques and their roles in building machine learning methods
CO-2: Understanding the basic concepts and principles of machine learning
CO-3: Applying supervised and unsupervised learning methods to data analysis problems and   solve various applications
CO-4: Evaluating and comparing solutions by various machine learning approaches for security

UNIT-I:
Introduction to Linear Algebra in Machine Learning: Scalars, Vectors, and Linear Functions, Linear Functions, Matrices, Matrix Transformations, Norms, Eigen decomposition, Singular Value Decomposition (SVD), Principal Component Analysis (PCA).

UNIT-II:
Introduction to Machine Learning: Machine learning, Train and Test Data, Cross-Validation, Underfitting and Overfitting, Gradient Descent, Building a Machine Learning Algorithm.

UNIT-III:
Supervised Learning: Basic methods, Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, and Support Vector Machines.
Linear models: Linear Regression, Logistic Regression, Generalized Linear Models

UNIT-IV:
Unsupervised Learning: Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion.

UNIT-V:
Machine Learning and Security: Introduction, Anomaly detection**,** When to Use Anomaly Detection Versus Supervised Learning, Anomaly Detection with Data and Algorithms.

UNIT-VI:
Malware Analysis: Understanding Malware, Defining Malware, Classification Malware: Behind the Scenes, Feature Generation, Data Collection Generating Features, Feature Selection, From Features to Classification, How to Get Malware Samples and Labels

TEXT BOOKS:
1. Machine Learning with R, Ghatak Abhijit, 2017 ISBN 978-981-10-6808-9
2. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012
3. Machine Learning & Security, Clarence Chio & David Freeman, 2018

REFERENCES:
1. Machine Learning, Tom M. Mitchell, MGH, ISBN: 0070428077

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M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN03) CLOUD BASED COMPUTING

COURSE OBJECTIVES:
- To apply trust-based security model to real-world security problems
- To know an overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures
- To learn the basic Cloud types and delivery models
- To understand the risk and compliance responsibilities and challenges for each Cloud type and service delivery model

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding security aspects of each cloud model
CO-2: Analyzing a risk-management strategy for moving to the Cloud
CO-3: Creating a public cloud instance using a public cloud service provider
CO-4: Applying trust-based security model to different layer

UNIT-I
Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing.

UNIT-II:
Cloud Computing Architecture: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model
Cloud Deployment Models: Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

UNIT-III:
Security Issues in Cloud Computing: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security
Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management.

UNIT –IV:
Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS.
Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations.

UNIT-V:
Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud.

UNIT-VI:
Advanced Topics: Recent developments in hybrid cloud and cloud security.

TEXT BOOKS:
1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, 2009
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, O'Reilly, 2009 ISBN-10: 0596802765

REFERENCES:
1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, 2011
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN04) DISTRIBUTED SYSTEMS

COURSE OBJECTIVES:
- To summarize the fundamental architectures and distributed system models
- To discriminate conventional OS with distributed OS features
- To understand synchronization problems and Clock mechanisms
- To analyse various security issues in distributed environment cryptographic algorithms and fault tolerant mechanisms

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Analyzing the problem with clock mechanisms in distributed environment
CO-2: Understanding the concept of distributed transactions, distributed operating system
CO-3: Remembering the concept of Fault Tolerant Mechanisms
CO-4: Applying various security algorithms

UNIT-I:
Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking.

UNIT-II:
Inter-Process Communication: Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, architecture, case study- SUN network file systems. Name Services Introduction; Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT-III:
Peer to Peer Systems: Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store. Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement – Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT–IV:
Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls. Distributed Transactions – Introduction, Flat and Nested Distributed Transactions.

UNIT-V:
Atomic Commit Protocols: Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Security – Introduction, Overview of Security techniques, Cryptographic algorithms.

UNIT-VI:
Digital signatures, Case studies-Kerberos, TLS, 802.11 WiFi. Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

TEXT BOOKS:
1. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore and T. Kindberg, Fourth Edition, Pearson Education
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis, 2010

REFERENCES:
1. Distributed Computing, S. Mahajan and S. Shah, Oxford University Press
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
3. Advanced Concepts in Operating Systems, M. Singhal, N. G. Shivarathri, and Tata McGraw Hill
4. Distributed Systems – Principles and Paradigms, A. S. Tanenbaum and M. V. Steen, Pearson Education
5. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani & Mukesh Singhal, Cambridge, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN05) DESIGNING THE INTERNET OF THINGS

COURSE OBJECTIVES:
- To describe the current vision of the Internet of Things and its impact on the world
- To identify and analyze the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- To experiment building blocks of Internet of Things and characteristics
- To implement and Summarize basic IoT applications in real time scenario

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding the physical and logical design of the Internet of Things
CO-2: Analyzing various applications of Internet of Things in various domain, IoT & M2M
CO-3: Evaluating System Management with NETCONF-YANG and Design
CO-4: Creating Logical Design of IoT Systems using Python

UNIT-I:
Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IoT Levels.

UNIT–II:
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.
IOT and M2M: Introduction, M2M, Difference between IOT and M2M, SDN and NFV for IOT

UNIT–III:
System Management with NETCONF-YANG: Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.
Developing Internet of Things: Introduction, IOT Design Methodology

UNIT -IV:
Logical Design using Python: Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages of interest for IOT.

UNIT -V:
IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device-Raspberry Pi, about Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python & other IOT Devices.

UNIT-VI:
IOT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models and Communication APIs, WAMP Autobahn for IoT, Xively Cloud for IoT, Python Web Application Framework – Django, Amazon Web Services for IoT.

TEXT BOOKS:
1. Internet of Things: A Hands-On Approach, Vijay Madisetti, Arshdeep Bahga, 2014, ISBN:978 0996025515
2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley, 2014

REFERENCES:
1. The Internet of Things, Samuel Greengard, MIT Press, Cambridge, 2015
2. Internet of Things: Principles and Paradigms, Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufman, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN06) SECURITY IN E – COMMERCE

COURSE OBJECTIVES:
- To prepare student to understand current threats facing organizations that conduct business online
- To apply cryptography and related security techniques to e-commerce including secure electronic transactions
- To understand electronic payment systems, intellectual property protection
- To know and understand security development cycle and security services

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding the various forms of electronic commerce and explain the range of threats to e-commerce security
CO-2: Remembering the different areas susceptible to malicious activity
CO-3: Analyzing different cryptographic techniques and their technical characteristics with respect to E-commerce
CO-4: Evaluating how cryptography can be, and is, used to achieve security

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

UNIT-II:
Security and Encryption: E-Commerce Security Environment – Security threats in E-Commerce environment – Policies, Procedures and Laws.

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

UNIT-IV:
Introduction to trusted computing platform: Overview – Usage Scenarios – Key components of trusted Platform – Trust mechanisms in a trusted platform. Trusted platforms for organizations and individuals –Trust models and the E-Commerce domain.

UNIT–V:
E-Commerce Security: SET for E-Commerce Transactions, Business requirements for SET, SET System Participants, Dual Signature and Signature, Authentication and Message Integrity, Payment Processing.

UNIT-VI:
Secure Internet Programming, Security development life cycle, Internet Security Standards and Internet Security Products, Trusted Internet Security services.

TEXT BOOKS:
1. E-Commerce Business Technology Society, Kenneth C. Laudon and Carol Guercio Trave, Pearson Education, 2005

2. Inter-Organizational Trust for Business-to-Business E- Commerce, Pauline Ratnasingam, IRM Press, 2005
3. Trusted Computing Platforms: TCPA Technology in Context, Siani Pearson, et al, Prentice Hall PTR, 2002

REFERENCES:
1. Frontiers Electronic Commerce, Ravi Kalakota and Andrew Whinston, 2nd Edition, Addison-Wesley, 1999
2. E Commerce, P. T. Joseph, 2nd Edition, Prentice Hall, 2008
3. E-Commerce Security and Privacy, Anup Gosh, 2001

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester (CNIS)	L	T/P	C
	0	3	1.5

(18PC2CN01) INFORMATION SECURITY AND NETWORKS LABORATORY

A)   INFORMATION SECURITY LABORATORY

COURSE OBJECTIVES:
- To classify symmetric encryption algorithms and analyze security aspects of symmetric and asymmetric algorithms
- To design and implement various digital signature algorithms

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Examine and implement symmetric and asymmetric algorithms
CO-2: Implement key generation and digital signature mechanisms

WEEK 1:
1.   Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2.   Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND, OR and XOR each character in this string with 127 and display the result.

WEEK 2:
1.   Write a Java program to perform encryption and decryption using the following algorithms
a)   Ceaser cipher
b)   Vigenere cipher
c)   Hill Cipher

WEEK 3:
1)   Write a JAVA program to implement the DES algorithm.
2)   Implement DES-2 and DES-3 using Java cryptography package.

WEEK 4:
1)   Write a Java program that contains functions, which accept a key and input text to DES encrypted/decrypted. This program should use the key to encrypt/decrypt the input by using the triple Des algorithm. Make use of Java Cryptography package

WEEK 5:
Write a C/JAVA program to implement Diffie-Hellman algorithm for secure key exchange.

WEEK 6:
1)   Write a Java program to implement RSA algorithm.
2)   Consider the end user as one of the parties (Alice) and the JavaScript application as the other party (Bob). Calculate the message digest of a text using the SHA-1 algorithm and MD5 algorithm in JAVA.

WEEK 7:
1)   Write a Java program to encrypt user's passwords before they are stored in a database table, and to retrieve them whenever they are to be brought back for verification.
2)   Write a program in java, which performs a digital signature on a given text using Diffie-Hellmann algorithm.

WEEK 8:   Lab Internal

TEXT BOOKS:
1. Build Your Own Security Lab, Michael Gregg, Wiley India
2. Cryptography and Network Security, Atul Kahate, TMH

REFERENCES:
1. Cyber Security Operations Handbook, J. W. Rittiaghouse and William M. Hancok, Elsevier

B)   NETWORKS LABORATORY

COURSE OBJECTIVES:
*   To describe about bit stuffing, character stuffing and CRC methods and to understand various routing algorithms and wireless LAN concepts
*   To understand various algorithms to identify shortest path and various Network layer protocols

COURSE OUTCOMES: After completion of the course, students should be able to
CO-3: Summarize data link layer framing methods, CRC, Dijkstra's algorithm and routing algorithms
CO-4: Demonstrate and simulate Ethernet, token ring, TCP and to configure VLAN and STP protocol

WEEK 9:
1. Implement the data link layer framing methods such as character stuffing and bit stuffing
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP

WEEK 10:
1. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
2. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm.

WEEK 11:
1. Demonstrate the operation of Ethernet.
2. Demonstrate the implementation of a token ring network

WEEK 12:
1. Demonstrate the congestion control algorithms implemented by the Transmission Control Protocol (TCP).
2. Demonstrate the configuring a wireless LAN

WEEK 13:
1. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.

WEEK 14:
1. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark   characterize traffic when the DNS server is up and when it is down.

WEEK 15:
1. Configuring VLAN protocol and analyzing results by sing VTP protocol.

WEEK 16:
1. Configuring STP protocol and observing results for loop free topology.

TEXT BOOKS:
1. Routing Protocols & Concepts, Rick Graziani, Pearson Education
2. LAN Switching & Wireless, Wayne Lewis, Pearson Education
3. Accessing the WAN, Bob Vachon, Pearson Education

REFERENCES:
1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Fifth Edition, Pearson Education, 2012
2. Computer Networks: A Systems approach, Larry L. Peterson & Bruce S. Davie, Fifth Edition, Elsevier, 2012
3. An Introduction to Network Programming with Java, Jan Graba, Springer, 2010
4. TCP/IP Protocol Suite, Behrouz A. Forouzan, Tata McGraw Hill 4th Edition, 2010
5. Network Fundamentals, Mark Dye, Pearson Education

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M.Tech. I Semester (CNIS)

	L	T/P	C
	0	3	1.5

(18PC2CN02) DATA STRUCTURES AND ALGORITHMS LABORATORY

COURSE OBJECTIVES:
- To understand abstract data types and differentiate linear and non-linear data structure
- To advance understanding of stack, queue and their applications
- To understand searching and sorting techniques in real-world scenarios
- To advance knowledge of graphs and tress and their applications

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding and applying the Techniques in Software Development Life cycle
CO-2: Apply fundamental knowledge of Data Structures in Real time applications
CO-3: Develop a project based on Algorithms and Data Structures
CO-4: Analyze and implement graphs and trees for real time applications

LIST OF EXPERIMENTS:

1) Write a program to implement single linked list
2) Write a program to implement double linked list
3) Write a program to implement circular single linked list
4) Write a programs to implement the following using an array. a) Stack ADT b) Queue ADT
5) Write a program that reads an infix expression and converts the expression to postfix form
6) Write a program to implement circular queue ADT using an array
7) Write programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT
8) Write programs to implement the deque (double ended queue)
9) Write programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
10) Write programs for implementing the following sorting methods:
a) Bubble sort   b) Merge sort   c) Insertion sort d) Heap sort e) Quick sort
11) Write a Java program to perform the following operations:
12) Construct a binary search tree of elements
13) Search for a key element in the above binary search tree. c)Delete an element from the above binary search tree
14) Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) Inorder c) Postorder
15) Write Java programs for the implementation of bfs and dfs for a given graph
16) Write Java programs to implementation of adjacency matrix

REFERENCES:
1. Data Structures and Algorithms in Java, A. Drozdek, 3rd Edition, Cengage Learning
2. Data Structures with Java, J. R. Hubbard, 2nd Edition, Schaum's Outlines, TMH
3. Data Structures and Algorithms in Java, R. Lafore, 2nd Edition, Pearson Education
4. Data Structures using Java, D. S. Malik and P. S. Nair, Cengage Learning
5. Data structures, Algorithms and Applications in Java, S. Sahani, 2nd Edition, Universities Press

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M.Tech. I Semester (CNIS)	L	T/P	C
	0	4	2

(18PW4CN01) TECHNICAL SEMINAR

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Identify a research topic related to advanced/state-of-the-art technologies

CO-2: Collect the literature and comprehend/analyze critically the technological advancements

CO-3: Engage in effective oral communication through presentation of seminar

CO-4: Engage in effective written communication through report

COURSE OUTLINE:
- A student shall present a seminar on a technical topic during I semester of the M.Tech. programme.
- A student, under the supervision of a faculty member, shall collect literature on a technical topic of his / her choice, critically review the literature and submit it to the Seminar Review Committee (SRC) in a prescribed report form.
- The SRC shall consist of Head of the Department, faculty supervisor and a senior faculty member of the specialization / department.
- Student shall make an oral presentation before the SRC after clearing the plagiarism check.
- Prior to the submission of seminar report to the SRC, its soft copy shall be submitted to the PG Coordinator for PLAGIARISM check.
- The report shall be accepted for submission to the SRC only upon meeting the prescribed similarity index.

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M.Tech. I Semester (CNIS)	L	T/P	C
	2	0	0

(18AU5CS01) RESEARCH METHODOLOGY AND IPR

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To introduce the characteristics of a good research problem
- To choose appropriate approaches of investigation of solutions for research problem
- To familiarize with basic Intellectual Property Rights
- To understand different Patent Rights

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understand research problem formulation, analyze research related information and follow research ethics
CO-2: Realize the importance of ideas, concept, and creativity in the present-day context
CO-3: Recognize that when IPR would take such important place in growth of individuals and nation, it is needless to emphasize the need of information about IPR to be promoted among students in general and engineering in particular
CO-4: Appreciate IPR protection which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

UNIT-I:
Introduction: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.
Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.

UNIT-II:
Literature Survey: Effective literature studies approaches, analysis. Plagiarism, Research ethics.

UNIT-III:
Effective Technical Writing: How to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of
Patenting and Development: technological research, innovation, patenting, development.
International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-VI:
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR.

TEXT BOOKS:

1. Research Methodology: An Introduction for Science & Engineering Students, Stuart Melville and Wayne Goddard
2. Research Methodology: An Introduction, Wayne Goddard and Stuart Melville
3. Resisting Intellectual Property, Halbert, Taylor & Francis Ltd ,2007

REFERENCES:

1. Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar, 2nd Edition
2. Research Methodology: Methods and Techniques, C. R. Kothari and Gaurav Garg, New Age International Publishers
3. Intellectual Property in New Technological Age, Robert P. Merges, Peter S. Menell, Mark A. Lemley, 2016
4. Intellectual Property Rights Under WTO, T. Ramappa, S. Chand, 2008

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M.Tech. II Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CN04) WIRELESS NETWORKS AND MOBILE COMPUTING

COURSE OBJECTIVES:
- To comprehend the differences between mobile and wireless
- To understand GSM Architecture, Goals of mobile IP and Ad-Hoc networks
- To give students knowledge of Broadcast Systems
- To analyze WAP, Bluetooth and Secure Environment

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding and remembering various Application areas of mobile and wireless devices
CO-2: Analyzing GSM Transmission Technologies and drawbacks of traditional TCP
CO-3: Applying architecture of DAB and DVB
CO-4: Evaluating various Mark-up Languages and their advantages/disadvantages and describe Smart client security

UNIT-I:
Introduction to Mobile and Wireless Landscape: The GSM Network Services - The architecture of the network - Communication management - The GPRS Network - Services - Network architecture - Radio interface - The UMTS Network - services - architecture of the network - HSPA evolutions - The NGN - Network architecture - The EPS Network - Network architecture.

UNIT-II:
Global System for Mobile Communications (GSM): GSM History - GSM RF Channels - GSM Protocol Stack - GPRS Standards - CS and PS Domains - GPRS Architecture - GPRS Network Architecture - GPRS Protocols - CDMA Evolution - 3GPP2 Network Architecture - Mobile IP - UMTS Spectrum - UMTS Radio Access Network - UMTS Protocol Stacks - UMTS Multiple Access Network Architecture.

UNIT-III:
Mobile Network Layer: Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Problems and Limitations of MIP, MIPv4 Route Optimization.

UNIT-IV:
Broadcast Systems: Overview, Cyclical repetition of data, Digital audio data broadcasting: Multimedia object transfer protocol, Digital video broadcasting: DVB broadcasting, DVB for high-speed internet access, Convergence of broadcasting and mobile communications.

UNIT-V:
Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

UNIT-VI:
Mobile and Wireless Security: Creating a Secure Environment, Security Threats, Security Technologies, Other Security Measures, WAP Security, Smart Client Security.

TEXT BOOKS:
1. Mobile Communications, Jochen Schiller, Second Edition, Pearson Education, 2008
2. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley, 2008

3.   Mobile Computing, Asoke K. Talukder, et al., Tata McGraw Hill, 2008

REFERENCES:
1.   Mobile Computing, Raj Kamal, Oxford University Press
2.   Wireless Communications & Networks, William Stallings, Second Edition, Pearson, 2007
3.   Fundamentals of Mobile and Pervasive Computing, Frank Adelstein et al., TMH, 2005
4.   Wireless Networks First-Step, Jim Geier, Pearson, 2005
5.   2.5G Mobile Networks: GPRS and EDGE, Sumit Kasera et al., TMH, 2008

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M.Tech. II Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CP05) SOFT COMPUTING

COURSE OBJECTIVES:
- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario
- To implement soft computing-based solutions for real-world problems
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms
- To provide students an hand-on experience on MATLAB to implement various strategies

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Identify and describe soft computing techniques and their roles in building intelligent machines
CO-2: Analyze fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
CO-3: Apply neural networks and genetic algorithms to combinatorial optimization problems
CO-4: Evaluate and compare solutions by various soft computing approaches for a given problem

UNIT-I:
Introduction to Soft Computing: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics.

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

UNIT-V:
Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

UNIT-VI:
Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

TEXT BOOKS:
1. Neuro-Fuzzy and Soft Computing, S. R. Jang, C. T. Sun and E. Mizutani, PHI / Pearson Education, 2004
2. Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa, Wiley, 2011

REFERENCES:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall, 1995
2. An Introduction to Genetic Algorithm, Melanic Mitchell, MIT Press, 1996
3. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Wiley, 2010
4. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G. A. V. Pai, 1st Ed., PHI, 2003

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M.Tech. II Semester (CNIS)	L	T/P	C
	3	0	3

(18PC1CN05) WEB SCRIPTING LANGUAGES

COURSE OBJECTIVES:
- To introduce PHP language for server side scripting
- To introduce XML and processing of XML Data with Java
- To introduce Server side programming with Java Servlets and JSP
- To introduce Client side scripting with Java script and AJAX

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: To gain knowledge of client side scripting, validation of forms and AJAX programming
CO-2: To understanding of server side scripting with PHP language
CO-3: To understand what is XML and how to parse and use XML Data with Java

UNIT-I:
Perl: Introduction to Perl and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-II
Java Script: Introduction to Java Script, Data Types, Operators, Statements, functions, Objects, Events, Forms, Programming examples.

UNIT-III:
PHP: Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads.

UNIT-IV:
Adv. PHP: Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT-V:
Ajax: Introduction to AJAX, Ajax Frameworks, HTML in AJAX, XML and Ajax, Ajax Applications, OO JavaScript and Refactoring Ajax, JavaScript Object Notation (JSON), XSLT Transformations with JavaScript, Drag and Drop, More Ajax Applications.

UNIT-VI:
Python: Introduction, Variables, Numbers, Strings, Operators, Lists, Tuples, Sets, Dictionaries, Statements, Functions, Arrays, Class & Objects, Programming examples.

TEXT BOOKS:
1. The World of Scripting Languages, David Barron
2. The Complete Reference PHP, Steven Holzner, Tata McGraw-Hill
3. Ajax In Action, Darren James, Dave Crane, and Eric Pascarello

REFERENCES:
1. Web Technologies, Uttam K. Roy, Oxford University Press

2. Programming Ruby, The Pragmatic Programmers' Guide 1.9, Dave Thomas, Pragmatic Bookshelf, ISBN 0974514055
3. Learning Perl, Randal L. Schwartz, O'Reilly
4. Learning PHP and MySQL, Jon A. Phillips and Michele E. Davis, O'Reilly
5. Learning Ruby, Michael James Fitzgerald, O'Reilly

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M.Tech. II Semester (CNIS)   L   T/P   C
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(18PE1CN07) FUNDAMENTALS OF WIRELESS SENSOR NETWORKS

COURSE OBJECTIVES:
- To classify mobile ad hoc networks, design and implementation issues, and available solutions
- To demonstrate routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid
- To distinguish clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless
- To summarize on sensor networks and their characteristics

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Remembering the concept of ad-hoc and sensor networks, their applications and typical node and network architectures
CO-2: Analyzing protocol design issues (especially energy-efficiency)
CO-3: Evaluating protocol designs for wireless sensor networks
CO-4: Creating protocol designs in terms of their energy-efficiency

UNIT-I:
Introduction: Fundamentals of Wireless Communication Technology. The Electromagnetic Spectrum. Radio Propagation Mechanisms. Characteristics of the Wireless Channel. Modulation Techniques. Multiple Access Techniques. Voice Coding. Error Control. Computer Networks. Computer Network Software. Computer Network Architecture. IEEE 802 Networking Standards.

UNIT-II:
Wireless Internet, Adhoc Wireless Networks, MAC Protocols in Adhoc Wireless Networks
Quality of Service: Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based Qos Routing Protocols

UNIT-III:
Energy Management Adhoc Networks: Need for Energy Management – Classification of Energy Management Schemes – Battery Management and Transmission Power Management Schemes – Network Layer and Data Link Layer Solutions – System power Management schemes.

UNIT-IV:
Mesh Networks: Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic Routing – Self Configuration and Auto Configuration - Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

UNIT-V:
Sensor Networks: Introduction – Sensor Network architecture – Data Dissemination – Data Gathering – MAC Protocols for sensor Networks – Location discovery.

UNIT-VI:
Quality of Sensor Networks – Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks

TEXT BOOKS:
1. Ad hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy and B. S. Manoj, Pearson Education, 2004
2. Ad Hoc And Sensor Networks - Theory and Applications, Dharma Prakash Agrawal, Carlos De Morais Cordeiro, Cambridge University Press, 2010
3. Mobile Ad Hoc Networks: Current Status and Future Trends, Jonathan Loo (Editor), Jaime Lloret Mauri (Editor), Jesús Hamilton Ortiz (Editor), CRC Press, 2011

REFERENCES:
1. Ad Hoc and Sensor Networks, Cordeiro, World Scientific Publishing Company, 2013
2. Wireless Ad hoc and Sensor Networks: Protocols, Performance, and Control, Jagannathan Sarangapani, Taylor & Francis/BSP Books, 2007
3. Wireless Ad Hoc and Sensor Networks, Houda Labiod, ISTE, 2007
4. Security and Privacy in Ad-Hoc and Sensor Networks, Refik Molva (Editor), Gene Tsudik (Editor), Dirk Westhoff (Editor), Springer, 2008

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M.Tech. II Semester (CNIS)	L	T/P	C
	3	0	3

(18PE1CN08) INTRUSION DETECTION

COURSE OBJECTIVES:
- To compare alternative tools and approaches for Intrusion detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion
- To identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion detection systems
CO-2: Evaluate the security an enterprise and appropriately apply Intrusion Detection tools and techniques in order to improve their security posture
CO-3: Analyze zero- day detection-Insider Threat issues

UNIT-I:
Introduction: The state of threats against computers, and networked systems-Challenges in computer security Solutions - Vulnerability assessment, firewalls, VPN's - Intrusion Detection and Intrusion Prevention- Network and Host-based IDS, A General IDS model and taxonomy, what are signature based and anomaly-based IDS.

UNIT-II:
Strategies of the Attacker: Malicious Code Analysis, Classification of Infection Strategies, Basic Self Protection Strategies; Strategies of Computer worms, Exploits, Vulnerabilities and Buffer overflow attacks.

UNIT-III:
Classes of Network Attacks: Probes, Privilege Escalation Attacks, Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks, Worms Attacks, Routing Attacks

UNIT-IV:
Detection Approaches: Misuse Detection - Pattern Matching, Rule based Techniques, State based Techniques, Techniques based on Data Mining; Anomaly Detection- Advanced Statistical Models, Rule based techniques, Biological Models, Learning Models; Specification based Detection; Hybrid Detection.

UNIT-V:
Theoretical Foundations of Detection: Taxonomy of Anomaly Detection Systems, Fuzzy Logic, Bayes Theory, Artificial Neural Networks, Support Vector Machines (SVM), Evolutionary Computation, Association Rules, Clustering; Evaluation Criteria- Accuracy, Performance, Completeness, Timely Response

UNIT-VI:
Crimeware: Understanding New Attacks and Defences: Overview of Crimeware, Bot Networks, Rootkits, Cybercrime and Politics, Online Advertising Fraud, The Future of Crimeware

TEXT BOOKS:
1. The Art of Computer Virus Research and Defense, Peter Szor, Symantec Press ISBN 0-321-30545-3
2. Network Intrusion Detection and Prevention – Concepts and Techniques, Ali A. Ghorbani, Wei Lu Mahbod Tavallaee, Springer, 2010
3. Crimeware, Understanding New Attacks and Defenses, Markus Jakobsson and Zulfikar Ramzan, Symantec Press, ISBN: 978-0-321-50195-0 2008

REFERENCES:
1. Anomaly Detection Principles and Algorithms, Kishan G. Mehrotra, Chilukuri K. Mohan, Hua Ming Huang, Springer, 2017
2. Intrusion Prevention System-A Complete Guide, Gerardus Blokdyk, 5STARCooks, 2019
3. Implementing Intrusion Detection Systems, Crothers Tim, John Wiley & Sons Inc, 2002

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M.Tech. II Semester (CNIS)   **L**   **T/P**   **C**
                                                  3   **0**   **3**

(18PE1CN09) NETWORK PROGRAMMING

COURSE OBJECTIVES:
- To analyze the working principle of networks, and topologies by implementing commands, shell scripts and files
- To evaluate different IPC mechanisms
- To understand Message queues, semaphores and shared memory
- To acquire knowledge on sockets

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding the network hardware, network topologies, and protocols
CO-2: Remembering the importance of IPC and signals
CO-3: Creating applications on shared memory, message queues
CO-4: Applying and analyzing the knowledge in developing client server application to support communication interfaces

UNIT-I:
Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell (bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell Meta characters, file name substitution, shell variables, command Substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

UNIT-II:
Files: File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink.

UNIT-III:
File and Directory Management: Directory contents, Scanning Directories- Directory file APIs.
Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT-IV:
Signals: Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.
Interprocess Communication: Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, Semaphores and shared memory.

UNIT-V:
Message Queues: Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.
Shared Memory- Kernel support for shared memory, Unix system V APIs for shared memory, client/server example.

UNIT-VI:

Network IPC: Introduction to Unix Sockets, IPC over a network, Client-Server model, Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless - Communication,

Example-

Client/Server Programs- Single Server-Client connection, multiple simultaneous clients, Socket options - setsockopt, getsockopt, fcntl.

TEXT BOOKS:

1. Unix System Programming using C++, T. Chan, PHI
2. Unix Concepts and Applications, Sumitabha Das, 4th Edition, TMH
3. Unix Network Programming, W. R. Stevens, PHI

REFERENCES:

1. Linux System Programming, Robert Love, O'Reilly, SPD
2. Advanced Programming in the Unix environment, W. R. Stevens, 2nd Edition, Pearson Education
3. Unix for Programmers and Users, Graham Glass, King Ables, 3rd Edition, Pearson Education
4. Unix Network Programming- The Sockets Networking API, Vol.-I, W. R. Stevens, Bill Fenner, A. M. Rudoff, Pearson Education
5. Unix Shell Programming, S. G. Kochan and P. Wood, 3rd Edition, Pearson Education

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M.Tech. II Semester (CNIS)	L	T/P	C
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(18PE1CN10) ETHICAL HACKING

COURSE OBJECTIVES:
- To ability to quantitatively assess and measure threats to information assets
- To evaluate where information networks are most vulnerable
- To apply security plans designed for protecting data assets against attacks
- To perform penetration tests into secure networks for evaluation purposes

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding and experience in Ethical Hacking
CO-2: Creating techniques to minimize risks of attacks
CO-3: Analyzing different techniques and methods applied by hackers
CO-4: Applying SQL injection and penetration test methods

UNIT-I:
Introduction to Ethical Hacking, Ethics, and Legality: Ethical Hacking Terminology, Different Types of Hacking Technologies, Different Phases Involved in Ethical Hacking and Stages of Ethical Hacking: Passive and Active Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks, Hacktivism, Types of Hacker Classes, Skills Required to Become an Ethical Hacker, Vulnerability Research, Ways to Conduct Ethical Hacking, Creating a Security Evaluation Plan, Types of Ethical Hacks.
Foot printing and Social Engineering: Foot printing, Information Gathering Methodology, DNS Enumeration Who is and ARIN Lookups, Trace route, Social Engineering, Common Types Of Attacks, Insider Attacks, Identity Theft, Phishing Attacks, Online Scams, URL Obfuscation, Social-Engineering Countermeasures

UNIT-II:
System Hacking: Understanding Password-Cracking Techniques, Password-Cracking Countermeasures, 48 Understanding Different Types of Passwords Passive Online Attacks, Active Online Attacks, Offline Attacks Non-electronic Attacks, Understanding Key loggers and Other Spyware Technologies Understand Escalating Privileges, Executing Applications, Buffer Overflows, Understanding Rootkits Planting, Understanding How to Hide Files, NTFS File Streaming NTFS Stream Countermeasures, Understanding Steganography Technologies, Understanding How to Cover Your Tracks and Erase Evidence, Disabling Auditing, Clearing the Event Log.

UNIT-III:
Trojans, Backdoors, Viruses, and Worms: Trojans and Backdoors, Overt and Covert Channels, Types of Trojans, Reverse Connecting Trojans, Netcat Trojan, Indications of a Trojan Attack, Trojan Construction Kit and Trojan Makers, Countermeasure Techniques in Preventing Trojans, Difference between a Virus and a Worm, Types of Viruses, Understand Antivirus Evasion Techniques, Understand Virus Detection Methods
Session Hijacking: Denial of Service, Session Hijacking, Spoofing vs. Hijacking, Types of Session Hijacking, Sequence Prediction, Steps in Performing Session Hijacking, Prevention of Session Hijacking

UNIT-IV:
Hacking Web Servers, Web Application Vulnerabilities, and Web-Based Password Cracking Techniques: Hacking Web Servers, Types of Web Server Vulnerabilities, Attacks against Web Servers, Web Server Hardening Methods Web Application Vulnerabilities, Objectives of Web Application Hacking, Anatomy of an Attack, Web Application Threats, Google Hacking, Web Application Countermeasures. Web-Based Password Cracking Techniques, Authentication

Types, Password Cracker, Password Attacks: Classification Password- Cracking Countermeasures

UNIT-V:
SQL Injection and Buffer Overflows: SQL Injection, Steps to Conduct SQL Injection, SQL Server Vulnerabilities, SQL Injection Countermeasures Buffer Overflows, Types of Buffer Overflows and Methods of Detection, Stack-Based Buffer Overflows, Buffer Overflow Mutation Techniques

UNIT-VI:
Linux Hacking Linux Basics, Compile a Linux Kernel, GCC Compilation Commands, Install Linux Kernel Modules, Linux Hardening Methods
Penetration Testing Methodologies
Security Assessments, Penetration Testing Methodologies, Penetration Testing Steps, Pen-Test Legal Framework, Automated Penetration Testing Tools, Pen-Test Deliverables.

TEXT BOOKS:
1.   CEH official Certified Ethical Hacking Review Guide, Wiley India
2.   Certified Ethical Hacker, Michael Gregg, Pearson Education
3.   Certified Ethical Hacker, Matt Walker, TMH

REFERENCES:
1.   Hacking: The Art of Exploitation, Jon Erickson, 2nd Edition
2.   Hacking: Computer Hacking, Security Testing, Penetration Testing, and Basic Security, Gary Hall and Erin Watson, 2016
3.   The Hardware Hacker: Adventures in Making and Breaking Hardware, Andrew Bunnie Huang, 1st Edition
4.   Ethical Hacking and Network Defense, Michael T. Simpson, Cenage Learning

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(18PE1CN11) SECURITY ASSESSMENT AND RISK ANALYSIS

COURSE OBJECTIVES:
- To describe the concepts of risk management
- To define and differentiate various Contingency Planning components
- To integrate the IRP, DRP, and BCP plans into a coherent strategy to support sustained organizational operations.
- To define and be able to discuss incident response options and design an Incident Response Plan for sustained organizational operations.

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Capable of recommending contingency strategies including data backup and recovery and alternate site selection for business resumption planning
CO-2: Skilled to be able to describe the escalation process from incident to disaster in case of security disaster
CO-3: Capable of designing a disaster recovery plan for sustained organizational operations.
CO-4: Capable of designing a business continuity plan for sustained organizational operations

UNIT-I:
Security Basics: Information Security (INFOSEC) Overview: critical information characteristics – availability information states – processing security countermeasures education, training and awareness, critical information characteristics – confidentiality critical information characteristics – integrity, information states – storage, information states – transmission, security, countermeasures policy, procedures and practices, threats, vulnerabilities.

UNIT-II:
Threats to and Vulnerabilities of Systems: Definition of terms (e.g., threats, vulnerabilities, risk), major categories of threats (e.g., fraud, Hostile Intelligence, Service (HOIS), malicious logic, hackers, environmental and technological hazards, disgruntled employees, careless employees, HUMINT, and monitoring), threat impact areas, Countermeasures: assessments (e.g., surveys, inspections), Concepts of Risk Management: consequences (e.g., corrective action, risk assessment), cost/benefit analysis of controls, implementation of cost effective controls, monitoring the efficiency and effectiveness of controls (e.g., unauthorized or inadvertent disclosure of information), threat and vulnerability assessment.

UNIT-III:
Security Planning: Directives and procedures for policy mechanism, Risk Management: acceptance of risk (accreditation), corrective actions information identification, risk analysis and/or vulnerability assessment components, risk analysis results evaluation, roles and responsibilities of all the players in the risk, analysis process, Contingency Planning/Disaster Recovery: agency response procedures and continuity of operations, contingency plan components, determination of backup requirements, development of plans for recovery actions after a disruptive event, development of procedures for off site processing, emergency destruction procedures, guidelines for determining critical and essential workload, team member responsibilities in responding to an emergency situation.

UNIT-IV:
Policies and Procedures, Physical Security Measures: Alarms, building, construction, cabling, communications centre, environmental controls (humidity and air conditioning), filtered power, physical access control systems (key cards, locks and alarms),Personnel Security Practices and Procedures: access authorization/verification

(need to know), contractors, employee clearances, position sensitivity, security training and awareness, systems maintenance personnel, Administrative Security Procedural Controls: attribution, copyright protection and licensing Auditing and Monitoring: conducting security reviews, effectiveness of security programs, investigation of security breaches, privacy review of accountability controls, review of audit trails and logs.

UNIT-V:
Operations Security (OPSEC): OPSEC surveys/OPSEC planning INFOSEC: computer security – audit, cryptography encryption (e.g., point to point network, link), cryptography key management (to include electronic key), cryptography strength (e.g., complexity, secrecy, characteristics of the key),

UNIT-VI:
3 case studies of threat and vulnerability assessment

TEXT BOOKS:
1. Principles of Incident Response and Disaster Recovery, Whitman & Mattord, Course Technology ISBN: 141883663X

REFERENCES:
1. Security and Risk Mitigation Standard Requirements Paperback, Gerardus Blokdyk, 2018
2. The Security Risk Assessment Handbook
3. Security Analysis and Portfolio Management, S. Kevin
4. http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf

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M.Tech. II Semester (CNIS)

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(18PE1CN12) INFORMATION SECURITY MANAGEMENT AND STANDARDS

COURSE OBJECTIVES:
- To understand management aspects of information security
- To analyze security risks and associated assessment models like COBIT
- To distinguish proactive security mechanisms, like firewalls, IDS/IPS etc. and application audit methodology
- To identify various security standardizations and legal issues involving information security

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understand the security of information systems management
CO-2: Differentiate organizational network security related issues and mitigating mechanisms
CO-3: Manage in providing secure project and implementing it
CO-4: Interpret networking and security skills to industrial need

UNIT-I:
Information Systems in Organizations: Information Systems, Importance of Information systems, Functions of Information systems, Examples of Information Systems, Changing nature of Information Systems, Building Blocks of Information Security, CIA model.

UNIT-II:
Information Security Management in Organizations: Information Security Planning and Governance, Governance and framework, Security Policy, Standards, Guidelines and Procedures, Types of Security Policies-EISP, ISSP, SysSP, Criteria for selection of a policy, Information Security Management System (ISMS), Organizational responsibility for Information Security Management, Information Security Awareness Scenario in Indian Organizations

UNIT-III:
Risk Management: Overview of Risk Management, Risk Identification mechanisms, Asset Identification, Data Classification and management, Information Asset valuation, Information Prioritization, Vulnerability Identification, Risk Assessment models, Risk Control techniques, selecting a Risk Control strategy, Introduction to Quantitative and Qualitative Approaches, OCTAVE and COBIT frameworks.

UNIT-IV:
Security Technology: Physical Security for Information systems, Biometric controls for security, Biometric based security issues and challenges.
Finding Networking vulnerabilities, Firewalls – Processing modes, Categorization, Architectures, Selecting the right firewall, managing the Firewalls. Protecting Remote Connections – Virtual Private Networks for security.

UNIT-V:
Security Audit: Introduction to security audits, need for security audits, organizational roles, Auditor's roles, Types of security audits, Audit approaches Technology based audits, Penetration testing, Business Continuity and Disaster Recovery Planning.

UNIT-VI:
Security Management Standards: Overview of ISO 17799/ISO 27001 Standards, System Security Engineering Capability Maturity Model (SSE-CMM). Legal, Ethical, and professional Issues in Information Security.

TEXT BOOKS:
1. Information Systems Security, Nina Godbole, Wiley India, 2009
2. Principles and Practices of Information Security. Michael E. Whitman, Herbert J. Mattord, Cengage Learning
3. Microsoft Security Risk Management Guide

REFERENCES:
1. http://www.gta.ufrj.br/ensino/cpe728/03_ins_info_security_iso_17799_1101.pdf
2. Firewalls and Network Security, Michael E. Whitman et al., Cengage Learning, 2008
3. Information Security Management Handbook, Harold F. Tipton, CRC Press, 2012
4. Information Security Policies and Procedures, Thomas R. Peltier, 2nd Edition, Auerbach, 2004

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M.Tech. II Semester (CNIS)	**L**	**T/P**	**C**
	0	**3**	**1.5**

(18PC2CN03) WIRELESS NETWORKS SIMULATION AND SOFT COMPUTING LABORATORY

A) WIRELESS NETWORKS SIMULATION LABORATORY

COURSE OBJECTIVES:
- To understand fundamentals of wireless networks
- To experiment and design various wireless scenarios for network research and Analyze different routing algorithms for MANETs

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply different scenarios for wired and wireless networks on simulator
CO-2: Evaluate TCP, UDP connection between nodes in a network and routing in MANETs

WEEK 1, 2:
Write a script to create fixed wireless nodes with color and initial position
Write a script to create wireless nodes and change the color of nodes randomly
Write a script to create wireless nodes with mobility.
Write a script to TCP communication between wireless nodes
Write a script for dynamic 2-node wireless scenario with TCP connection.
Check the Packets are exchanged between the nodes as they come within hearing range and drop when they are moving away.

WEEK 3:
Write a script to connection over a 3 node network over an area of size (500m*400m) The nodes (n0, n1, n2) position respectively At initially (5, 5) (490, 285) (150, 240) At time 10sec node1 start moving towards point (250, 250) at speed of 3m/s At time 15sec node0 start moving towards point (480, 300) at speed of 5m/s At time 20sec node1 start moving towards point (480, 3000) at speed of 5m/s Node2 is constant Take total simulation time 150sec, at time 10s a TCP connection initiated between node0 and node1 a) Use DSDV and IEEE802.11 MAC b) Use AODV and IEEE802.11 MAC

WEEK 4:
A simple topology to illustrate the hidden node problem using the IEEE802.11a setting (Take 4 nodes as n0 to n1: CBR traffic at rate 700kb, n2 to n3: CBR traffic at rate3Mb, n1 is in the carrier sense range of n2, but n0 is not).

WEEK 5:
Write a script to create wireless nodes with change destination and color of nodes randomly at particular time interval. For a wireless consisting of three mobile nodes (n0-n2), write a script and make an ad- hoc simulation to output in trace file. Use the routing protocol as Ad-hoc on demand vector (AODV).

WEEK 6:
For a wireless network consisting of three mobile nodes (n0-n2), write a   script and make an ad-hoc simulation to analyze the output in the trace file. Use the routing protocol as a destination sequence distance vector (DSDV).

WEEK 7:
For a wireless network consisting of three mobile nodes (n0-n2), write a   script and make an ad-hoc simulation to analyze the output in the trace file. Use the routing protocol as dynamic source routing (DSR).

WEEK 8:
Write a script for multi hop TCP communication in Wireless network with the use of MANET routing protocol AODV.

WEEK 9:
Write a script for multi hop TCP communication in Wireless network with the use of MANET routing protocol DSDV.

WEEK 10:
Write a script for multi hop TCP communication in Wireless network with the use of MANET routing protocol DSR.

TEXT BOOKS:
1. Mobile Communication, Jochen Schiller, Second Edition, Pearson Education, 2008
2. Mobile and Wireless Design Essentials, Martyn Mallick, Wiley, 2008
3. Mobile Computing, Asoke K. Talukder, et al., Tata McGraw Hill, 2008

REFERENCES:
1. Mobile Computing, Raj Kamal, Oxford University Press
2. Wireless Communications & Networks, William Stallings, Second Edition, Pearson, 2007
3. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein et al., TMH, 2005
4. Wireless Networks First-Step, Jim Geier, Pearson, 2005
5. 2.5G Mobile Networks: GPRS and EDGE, Sumit Kasera et al., TMH, 2008

B) SOFT COMPUTING LABORATORY

COURSE OBJECTIVES:
- To introduce soft computing concepts and techniques and foster their abilities in designing for real-world problems
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms and to provide students hand-on experience on MATLAB to implement various strategies

COURSE OUTCOMES: After completion of the course, students should be able to
CO-3: Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
CO-4: Apply genetic algorithms to combinatorial optimization problems and to Evaluate and compare solutions by various soft computing approaches for a given problem

WEEK 11:
1. To perform Union, Intersection and Complement operations.
2. To implement De-Morgan's Law.
3. To plot various membership functions.

WEEK 12:
1. To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality and service.
2. To implement FIS Editor

WEEK 13:
1. Perceptron net for an AND function with bipolar inputs and targets.
2. To calculate the weights for given patterns using hetero associative neural net.

WEEK 14:
1. To store vector in an auto-associative net. Find weight matrix & test the net with input

TEXT BOOKS:
1. Neuro Fuzzy and Soft Computing, Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Prentice Hall of India, 2003
2. Principles of Soft Computing, S. N. Deepa and S. N. Sivanandam, 2nd Edition
3. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall, 1995

REFERENCES:
1. Soft Computing Techniques, N. P. Padhy, S. P. Simon Oxford
2. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaram & G. A. Vijyalakshmi Pai, PHI
3. Advances in Soft Computing: Engineering Design and Manufacturing, 2003 Edition, Springer
4. MATLAB Toolkit Manual

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(18PC2CN04) WEB SCRIPTING LANGUAGES LABORATORY

COURSE OBJECTIVES:
- To understand the importance of the web as a medium of communication
- To understand the principles of creating an effective web page, including an in-depth consideration of information architecture
- To understand PHP language for server side scripting

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Gain knowledge of client side scripting, validation of forms and AJAX programming
CO-2: Have understanding of server side scripting with PHP language
CO-3: Have understanding of what is XML and how to parse and use XML Data with Java

WEEK NO.

1. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.
   Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

2. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

3. Write a Perl program to display a digital clock which displays the current time of the server.

4. a) Write your first name repeated five times using a while loop.
   b) Write your last name in increasing heading size starting with h1 till h6. Use a for loop this time.

5. a) Write a function that sums the values of three numbers.
   b) Write PHP code to change the background color of the page and display a welcome message including the given name submitted in the html form.

6. Write a PHP script that will connect to your MySQL database and query your birthday table, selecting all the rows and columns. Display the results as an HTML table in a web page.
   a) Modify the query to select only the thename column, for all rows in your birthday table.
   b) Modify the query to select all the columns in your birthday table for those rows with a birth month in March.
   c) Modify the query to select only the thename column in your birthday table for those rows with a birth month in March.

7. Lab Internal Examination –I
8. Simple AJAX programs
9. a) Example to demonstrate how a web page can fetch information from an XML file with AJAX
   b) Display XML data in HTML Table
10. Example to demonstrate how a web page can communicate with a web server while

a user types characters in an input field.

11.   a) Write a python program for greatest of 3 numbers.
        b) Write a python program for sum of squares of 1st n natural numbers.

12.   a) Write a python program to print pyramid of numbers.
        b) Write a python program to reserve a given number.

13.   a) Write a python program for dictionary with keys having multiple in pairs.
        b) Write a python program for Linear Search.

14.   a) Write a python program for to find largest element in the given array.
        b) Write a python program for string concatenation, string split.

15.   a) Write a python program for bubble sort.
        b) Write a python program to convert time from 12hrs to 24hrs format.

16.   Lab Internal Examination -II

TEXT BOOKS:
1. Web Technologies, Uttam K. Roy, Oxford University Press
2. The Complete Reference PHP, Steven Holzner, Tata McGraw-Hill
3. Java Script The Complete Reference, Thomas Powel, McGraw-Hill Education

REFERENCES:
1. Learning Perl, Randal L. Schwartz, O'Reilly
2. PHP & MySQL: The Missing Manual, Brett McLaughlin, 2nd Edition
3. Learning PHP and MySQL, Jon A. Phillips and Michele E. Davis, O'Reilly

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(18PW4CN02) MINI-PROJECT

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understand the formulated industry / technical / societal problems
CO-2: Analyze and / or develop models for providing solution to industry / technical / societal problems
CO-3: Interpret and arrive at conclusions from the project carried out
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through project report

COURSE OUTLINE:
- A student shall undergo a mini-project during II semester of the M.Tech. programme.
- A student, under the supervision of a faculty member, shall collect literature on an allotted project topic of his / her choice, critically review the literature, carry out the mini-project, submit it to the department in a prescribed report form.
- Evaluation of the mini-project shall be done by a Project Review Committee (PRC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the specialization / department.
- Prior to the submission of mini-project report to the PRC, its soft copy shall be submitted to the PG Coordinator for PLAGIARISM check.
- The mini-project report shall be accepted for submission to the PRC only upon meeting the prescribed similarity index.

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M.Tech. II Semester (CNIS)   L   T/P   C
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(18AU5EN01) ENGLISH FOR ACADEMIC AND RESEARCH WRITING

COURSE OBJECTIVES:
- To understand the usage of appropriate vocabulary (Formal, Informal, Gender Insensitive etc.)
- To understand the features and processes of academic writing
- To identify the resources
- To understand standard documentation styles

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Use appropriate vocabulary (Formal, Informal, Slang, Gender Insensitive etc.)
CO-2: Employ processes of academic writing
CO-3: Identify the resources
CO-4: Understand standard documentation styles

UNIT- I:
Introduction to Research:
i.   Identifying the topic
ii. Identifying Sources; Finding Sources
iii. Defining the broad area; Defining the specific area; Difference between a broad area and specific area
iv. Choosing a topic
v.   Mechanics of Writing – Language, Tone, Style, Ethics

UNIT-II:
Referencing & Library Skills:
i.   Literature Survey
ii. Writing Objectives
iii. Hypothesis
iv. Methodology
v.   Prospects for Future Research

UNIT-III:
Academic Writing Skills:
i.   Paraphrasing
ii. Summarizing
iii. Quoting
iv. Rewriting
v.   Expansion

UNIT-IV:
Kinds of Academic Writing:
i.   Essays
ii. Reports
iii. Reviews
iv. SOPs
v.   Abstracts
vi. Proposals

UNIT-V:
Research Process:
i.   Selection of Topic

ii.   Formulation of Hypothesis
iii.   Collection of Data
iv.   Analysis of Data
v.   Interpretation of Data
vi.   Presentation of Data

UNIT-VI:
i.   Title
ii.   Abstract
iii.   Introduction
iv.   Literature Survey
v.   Methodology
vi.   Discussion
vii.   Findings/Results
viii.   Conclusion
ix.   Documenting Sources

TEXT BOOKS:
1. Writing for Science, Goldbort R., Yale University Press (available on Google Books), 2006
2. Handbook of Writing for the Mathematical Sciences, Highman N., SIAM. Highman's Book, 1998

REFERENCES:
1. How to Write and Publish a Scientific Paper, Day R., Cambridge University Press, 2006
2. English for Writing Research Papers, Adrian Wall Work, Springer New York Dordrecht Heidelberg London, 2011
3. MLA Handbook for Research

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M.Tech. III Semester (CNIS)	L	T/P	C
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(18PE1SE10) SOFTWARE DEFINED NETWORKS

COURSE OBJECTIVES:
- To provide a comprehensive introduction to Software Defined Networking (SDN)
- To explain the importance of network virtualization over legacy network
- To identify the impact of SDN on traffic management and the potential on service growth, and discuss few potential issues
- To provide an overview on OpenFlow protocol, and their packet format

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understand the concepts of Software Defined Networking (SDN) and its network services and challenges
CO-2: Understand the business case and technology motivations for considering SDN solutions
CO-3: Learn how to identify the impact of SDN on traffic management and the potential for network service growth
CO-4: Learn the concepts of visualization, particularly the impact of visualization on servers and networks, service providers, legacy networks, and network vendors

UNIT-I:
Introduction to Software Defined Networking: Virtualization, Virtual Memory, Virtual Memory Operation, Virtual and Physical Memory Mapping, Server Virtualization, Network Function virtualization, Software Defined Networking, Network Limitations.

UNIT-II:
SDN Implementation: Introduction, SDN Implementation, SDN Design, Separation of the Control and Data Planes, Edge-Oriented Networking, SDN Operation, Service Providers and SDN, Benefits of SDN.

UNIT-III:
Openflow: Introduction, Overview of the OpenFlow Switch Specification, OpenFlow Ports, OpenFlow Packet-Processing Pipeline, OpenFlow Channel, Message Handling, OpenFlow Channel Connections, Controller Modes, Auxiliary Connection Use for Performance and Reliability, Flow Table Synchronization, Bundle Messages, OpenFlow Configuration-and-Management Protocol, Remote Configuration and The OpenFlow Conformance Testing Program

UNIT-IV:
SDN Controllers: Network Programmability, The Management Interface, The Application-Network Divide Modern Programmatic Interfaces, Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining.

UNIT-V:
SDN and Enterprise Networks: SDN and Optical Transport Networks, Increasing WAN Utilization with SDN, SDN Scalability Issues, Controller Designs for Scalability, Potential SDN Scalability Issues such as controller placement issue.

UNIT-VI:
SDN Management: Load Adaptation, Google and SDN, Google's G-Scale Network, Google's G-Scale Network Hardware, Google SDN Deployment, Implementation Challenges

TEXT BOOKS:
1. Software Defined Networking: Design and Deployment, Patricia A. Morreale and James M. Anderson, 1st Edition, CRC Press
2. SDN: Software Defined Networks, Thomas D. Nadeau and Ken Gray, Orielly Media

REFERENCES:
1. Software Defined Networking with OpenFlow, Siamak Azodolmolky, Wiley
2. Software Defined Networks: A Comprehensive Approach, Paul Goransson, Chuck Black, Morgan Kaufmann

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester (CNIS)   **L**   **T/P**   **C**
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(18PE1CN13) NETWORK MANAGEMENT SYSTEMS

COURSE OBJECTIVES:
- To develop skills like plan, install, configure, administer and manage a network
- To demonstrate network management architectures and protocols
- To illustrate students on how to install, maintain and manage Local Area Networks and internetworks
- To describe the automation of network management operations and making use of readily available network management systems

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding communication protocols and standards
CO-2: Remembering the use of SNMP protocols and services
CO-3: Evaluating various Network management tools
CO-4: Analyzing various services on Windows server platform troubleshoot network

UNIT-I:
Data Communications and Network Management Overview: Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT-II:
SNMPv1 Network Management: Organization and Information and Information Models. **Managed Network:** Case Histories and Examples, The history of SNMP management, The SNMP Model, The Organization Model, System Overview, The Information Model.

UNIT-III:
SNMPv2 Management: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, SNMP Script Language for creating MIB. The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

UNIT-IV:
SNMP Management: RMON: Remote Monitoring, RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, Case Study of Internet Traffic Using RMON

UNIT-V:
Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.

UNIT-VI:
Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network: Future Directions.

TEXT BOOK:
1. Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education

REFERENCES:
1. Network Management, Morris, Pearson Education
2. Principles of Network System Administration, Mark Burges, Wiley Dreamtech
3. Distributed Network Management, Paul, John Wiley
4. Suitable RFC Documents

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M.Tech. III Semester (CNIS) **L** **T/P** **C**
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(18PE1CN14) STORAGE AREA NETWORKS

COURSE OBJECTIVES:
- To expose the students to storage technology and disk drive components and to explore the various RAID concepts
- To understand the concepts of attached storage techniques and SAN evolution
- To enable the students to understand the disk drive and network attached storage techniques
- To understand the CAS architecture and storage visualization principles

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understanding Information availability and Business continuity and to describe the backup/recovery topologies
CO-2: Remembering local replication and remote replication technologies and their operation
CO-3: Analyzing processes and technologies for identifying, analyzing, and mitigating security risks in storage infrastructure
CO-4: Demonstrate effective oral and writing communication skills necessary to be effective and to compete at global business environment

UNIT-I:
Introduction to storage technology information storage, evolution of storage technology and architecture, data center infrastructure, key challenges in Managing information, information lifecycle. Storage system Environments: components of storage system environment, Disk Drive components, Disk Drive Performance, fundamental laws governing disk performance, logical components of the host, application requirements and disk performance.

UNIT-II:
Data Protection: RAID: Implementation of RAID, RAID array components, RAID levels, RAID comparison, RAID Impact on disk performance, host spares. Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage array, concepts in Practice: EMC CLARIION and Symmetric.

UNIT-III:
Direct – Attached Storage and Introduction to SCSI: Types of DAS, DAS benefits and limitations, disk drive interfaces, introduction to parallel SCSI, SCSI command model. Storage Area Networks: fibre channel, The SAN and Its evolution, components of SAN, FC connectivity, Fibre channel ports, fibre channel architecture, zoning, fiber channel login types, concepts in practice: EMC Connectrix.

UNIT-IV:
Network Attached Storage: general purpose servers vs NAS Devices, benefits of NAS, NAS file I/O, components of NAS, NAS Implementations, NAS file sharing protocols, NAS I/O operations, factors effecting NAS Performance and availability, concepts in practice

UNIT-V:
EMC Celerra.IP SAN: iscsi, fcip. Content – addressed storage: Fixed content and Archives, types of archives, features and benefits of CAS, CAS Architecture object storage and retrieval in CAS, CAS Examples, concepts in practice: EMC Centera. Storage Virtualization: Formas of Virtualization, SNIA Storage virtualization taxonomy, storage virtvalization configurations, storage virtualization challenges, types of storage virtualization, concepts in practice: EMC Invista, Rainifinity.

UNIT-VI:

Introduction to Business Continuity: Information availability, BC terminology, BC planning life cycle, Failure analysis, business impact analysis, BC technology solutions, concepts in practice: EMC Power path. Backup and recovery: backup purpose, backup considerations, backup granularity, recovery considerations, backup methods, backup process, backup and restore operations, backup topologies, backup in NAS environments, backup technologies, concepts in practice: EMC Networker, EMC Disk Library(EDL).

TEXT BOOKS:
1. EMC Corporation: Information Storage and Management, G. Somasundaram, A. Shrivastava, 1st Edition, Wiley, 2009
2. Robert Spalding, Storage Networks: The Complete Reference, 1st Edition, TMH, 2003

REFERENCES:
1. Building Storage Networks, Marc Farley, 2nd Edition, Tata McGraw-Hill, Osborne, 2001
2. Storage Area Network Fundamentals, Meeta Gupta, 2nd Edition, Pearson Education Limited, 2002

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M.Tech. III Semester (CNIS)	L	T/P	C
	3	0	3

(18OE1CN01) BUSINESS ANALYTICS

COURSE OBJECTIVES:
- To understand the role of business analytics within an organization and to analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making and to become familiar with processes needed to develop, report, and analyze business data
- To use decision-making tools/Operations research techniques and to manage business process using analytical and management tools
- To analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply knowledge of data analytics
CO-2: Think critically in making decisions based on data and deep analytics
CO-3: Use technical skills in predicative and prescriptive modeling to support business decision-making
CO-4: Translate data into clear, actionable insights

UNIT-I:
Business Analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.
Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II:
Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data Business Analytics Technology.

UNIT-III:
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT-IV:
Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.
Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V:
Decision Analysis: Formulating Decision Problems, Decision Strategies without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

UNIT-VI:
Recent trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS:
1. Business Analytics-Principles, Concepts, and Applications, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press
2. Business Analytics, James Evans, Pearson Education
3. Business Analytics, Purba Halady Rao, PHI, 2013

REFERENCES:
1. Business Analytics for Managers: Taking Business Intelligence Beyond Reporting, Gert H. N. Laursen, Jesper Thorlund, 2nd Edition, Wiley Publications
2. Business Analytics: Data Analysis & Decision Making, S. Christian Albright, Wayne L. Winston 5th Edition, 2015
3. Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman Elsevier, 2014

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M.Tech. III Semester (CNIS)	L	T/P	C
	3	0	3

(18OE1AM01) INDUSTRIAL SAFETY

COURSE PRE-REQUISITES: Elements of Mechanical, Civil, Electrical and Industrial Engineering

COURSE OBJECTIVES:
- To achieve an understanding of principles, various functions and activities of safety management
- To communicate effectively information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities
- To anticipate, recognize, and evaluate hazardous conditions and practices affecting people, property and the environment, develop and evaluate appropriate strategies designed to mitigate risk
- To develop professional and ethical attitude with awareness of current legal issues by rendering expertise to wide range of industries

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards
CO-2: Communicate effectively on health and safety matters among the employees and with society at large
CO-3: Demonstrate the use of state-of-the-art occupational health and safety practices in controlling risks of complex engineering activities and understand their limitations
CO-4: Interpret and apply legislative / legal requirements, industry standards, and best practices in accident prevention programmes in a variety of workplaces

UNIT-I:
Safety Management: Evaluation of modern safety concepts – Safety management functions – safety organization, safety department – safety committee, safety audit - performance measurements and motivation – employee participation in safety and productivity.

UNIT-II:
Operational Safety: Hot metal Operation – Boiler, pressure vessels – heat treatment shop - gas furnace operation-electroplating-hot bending pipes – Safety in welding and cutting. Cold-metal Operation- Safety in Machine shop-Cold bending and chamfering of pipes – metal cutting – shot blasting, grinding, painting – power press and other machines

UNIT-III:
Safety Measures: Layout design and material handling - Use of electricity – Management of toxic gases and chemicals – Industrial fires and prevention – Road safety– Safety of sewage disposal and cleaning – Control of environmental pollution – Managing emergencies in industrial hazards.

UNIT-IV:
Accident Prevention: Human side of safety – personal protective equipment – Causes and cost of accidents. Accident prevention programmes - Specific hazard control strategies - HAZOP – Training and development of employees – First Aid – Firefighting devices – Accident reporting investigation.

UNIT-V:
Safety, Health, Welfare & Laws: Safety and health standards – Industrial hygiene – occupational diseases prevention - Welfare facilities – History of legislations related to safety–

pressure vessel act- Indian boiler act- The environmental protection act – Electricity act - Explosive act.

UNIT-VI:

Safe Handling and Storage: Material Handling, Compressed Gas Cylinders, Corrosive Substances, Hydrocarbons, Waste Drums and Containers

TEXT BOOKS:
1. Safety Management, John V. Grimaldi and Rollin H. Simonds, All India Travellers Bookseller, New Delhi, 1989
2. Safety Management in Industry, Krishnan N. V., Jaico Publishing House, 1996

REFERENCES:
1. Occupational Safety Manual, BHEL
2. Industrial Safety and The Law, P. M. C. Nair Publishers
3. Managing Emergencies in Industries, Loss Prevention of India Ltd., Proceedings, 1999
4. Safety Security and Risk Management, U. K. Singh & J. M. Dewan, A. P. H. Publishing Company, 1996
5. Industrial Safety Management: Hazard Identification and Risk Control, L. M. Deshmukh, McGraw-Hill Education, 2005

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M.Tech. III Semester (CNIS)	L	T/P	C
	3	0	3

(18OE1AM02) OPERATIONS RESEARCH

COURSE PRE-REQUISITES: Mathematics, Industrial Engineering

COURSE OBJECTIVES:
- To analyze linear programming models in practical and their practical use
- To apply the transportation, assignment and sequencing models and their solution methodology for solving problems
- To apply the theory of games, replacement, inventory and queuing models and their solution methodology for solving problems
- To evaluate the dynamic programming and simulation models

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply and solve the dynamic programming problems
CO-2: Apply the concept of non-linear programming
CO-3: Carry out sensitivity analysis
CO-4: Model the real world problem and simulate it

UNIT-I:
Introduction to Operations Research - Definitions of OR, Characteristics of OR, Scope of OR, Classification of Optimization Techniques, models in OR, General L.P Formulation, Graphical solution, Simplex Techniques.

UNIT-II:
Revised simplex method - duality theory - dual simplex method – sensitivity or post optimality analysis - parametric programming

UNIT-III:
Nonlinear programming problem - Kuhn-Tucker condition, min cost flow problem - max flow problem - CPM/PERT

UNIT-IV:
Scheduling and sequencing, Inventory models, deterministic inventory, models - Probabilistic inventory control models - Geometric Programming.

UNIT-V:
Waiting line Models, Single and Multi-channel Problems, Dynamic Programming, Game Theory, Simulation .

UNIT-VI:
Introduction to Genetic Algorithms, Operators, applications to engineering optimization, Problems.

TEXT BOOKS:
1. Operations Research, S. D. Sharma, Kedarnath, 2012
2. Engineering Optimization, S. S. Rao, New Age International Publications, 2014
3. Introduction to Genetic Algorithms, S. N. Sivanandam, Springer

REFERENCES:
1. Operations Research-An Introduction, H. A. Taha, PHI, 2008
2. Principles of Operations Research, H. M. Wagner, PHI, Delhi, 1982
3. Introduction to Optimization: Operations Research, J. C. Pant, Jain Brothers, 2008

4. Operations Research, Hitler Liebermann, McGraw-Hill Pub., 2009
5. Operations Research, Pannerselvam, Prentice Hall of India, 2010

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M.Tech. III Semester (CNIS)	L	T/P	C
	3	0	3

(18OE1AM03) COMPOSITE MATERIALS

COURSE PRE-REQUISITES: Maths, Physics, Chemistry, Engineering Mechanics, Mechanics of Solids

COURSE OBJECTIVES:
- To understand composite materials and their properties, relationship between them and manufacturing methods
- To understand the principles of material science applied to composite materials
- To study the equations to analyze problems by making good assumptions and learn systematic engineering methods to solve practical composite mechanics problems

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Apply fundamental knowledge of mathematics to modeling and analysis of composite materials
CO-2: Understand the manufacturing methods of various composite materials
CO-3: Analyze the failure modes of composites

UNIT-I:
Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT-II:
Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements.
Mechanical Behavior of Composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III:
Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications.
Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV:
Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications, Introduction to Machining of Composites.

UNIT-V:
Elastic Behavior of Laminate: Basic assumptions, Strain-displacement relations, Stress-strain relation of layer within a laminate, Force and moment resultant, General load–deformation relations, Analysis of different types of laminates

UNIT-VI:
Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight

strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:
1. Material Science and Technology, Vol. 13–Composites, R. W. Cahn, VCH, West Germany
2. Analysis and Performance of Fiber Composites, B. D. Agarwal, Third Edition, Wiley

REFERENCES:
1. Mechanics of Composite Materials, Robert M. Jones, Second Edition, Scripta Book Company
2. Materials Science and Engineering-An Introduction, W. D. Callister Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, Indian Edition, 2007
3. Composite Materials: Science and Engineering, K. K. Chawla, Springer, 2012
4. Composite Materials Science and Applications (Engineering Materials and Processes), Deborah D. L. Chung, 2nd Edition, Springer, 2010
5. Composite Materials Design and Applications, Danial Gay, Suong V. Hoa and Stephen W. Tasi

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M.Tech. III Semester (CNIS)	L	T/P	C
	3	0	3

(18OE1PS01) WASTE TO ENERGY

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To create awareness in students of energy conservation
- To identify the use of different types of Bio waste energy resources
- To understand different types of bio waste energy conservations
- To detect different waste conversion into different forms of energy

COURSE OUTCOMES: After completion of the course, students should be able to
CO1: Find different types of energy from waste to produce electrical power
CO2: Estimate the use of bio waste to produce electrical energy
CO3: Understanding different types of bio waste and its energy conversions
CO4: Analyze the bio waste utilization and to avoid the environmental pollution

UNIT-I:
Introduction to Energy from Waste: Classification of waste as fuel, Agro based, Forest residue, Industrial waste, MSW (Municipal solid waste) – Conversion devices – Incinerators, Gasifiers, Digestors

UNIT-II:
Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III:
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV:
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V:
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion.

UNIT-VI:
Types of Biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:
1. Biogas Technology-Transfer and Diffusion, M. M. EL-Halwagi, Elsevier Applied Science Publisher, 1984
2. Introduction to Biomass Energy Conversions, Sergio Capareda, CRC Press, 2013

REFERENCES:
1. Non-Conventional Energy, Desai Ashok V., Wiley Eastern Ltd., 1990
2. Biogas Technology - A Practical Handbook, Khandelwal K. C. and Mahdi S. S., Vol. I   & II, Tata McGraw-Hill Publishing Co. Ltd., 1983
3. Food, Feed and Fuel from Biomass, Challal D. S., IBH Publishing Co. Pvt. Ltd., 1991
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996

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M.Tech. III Semester (CNIS)	L	T/P	C
	0	16	8

(18PW4CN03) PROJECT PART-I

M.Tech. IV Semester (CNIS)	L	T/P	C
	0	28	14

(18PW4CN04) PROJECT PART-II

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Identify and formulate the problem (Industry/technical/societal)
CO-2: Analyze, design and develop a solution to industry/technical/societal problems
CO-3: Implement and execute the solution
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through project report

COURSE OUTLINE:
- M.Tech. project work shall be for a minimum duration of 40 weeks spread over two semesters i.e., Project Part-I in III semester and Project Part-II in IV semester.
- A student shall be permitted to register for the major project after satisfying the attendance requirement in all the courses, i.e., theory and practical courses.
- Project reviews namely Project Review I and Project Review II in III semester and Project Review III and Project Pre-submission Seminar in IV semester shall be conducted during the course of Project work.
- A Project Review Committee (PRC) consisting of the Head of the Department as Chairperson and PG Coordinator, Project Supervisor and one senior faculty member of the Department offering the M. Tech. programme as members shall evaluate the progress of project work.
- In Project Review I, a student, in consultation with his Project Supervisor, shall present the title, objective and plan of action of his/her project work to the PRC for approval within four weeks from the commencement of III semester.
- A student can initiate the project work only after obtaining the approval of the PRC.
- The work on the project shall be initiated at the beginning of the III semester.
- Project Review II shall be conducted and evaluated at the end of the III semester.
- Project Review III shall be conducted during IV semester to examine the overall progress of the project work.
- A project pre-submission seminar shall be conducted to decide whether or not the project is eligible for final submission.
- After approval from the PRC, a soft copy of the thesis shall be submitted for PLAGIARISM check to the Examination Branch.
- At the end of IV semester upon fulfilling the above conditions, project viva-voce shall be conducted.
- A student shall submit project progress in prescribed report format during each of the project reviews.