

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M.Tech in Computer Networks and Information Security (CNIS)  
Common to (Computer Networks, CNIS)**

**EFFECTIVE FROM ACADEMIC YEAR 2017- 18 ADMITTED BATCH**

**COURSE STRUCTURE AND SYLLABUS**

**I Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-1	Advanced Algorithms	25	75	4	0	0	4
PC-2	Computer Networking	25	75	4	0	0	4
PC-3	Cryptography and Network Security	25	75	4	0	0	4
PE-1	1. Privacy and Security in Cyber Space 2. Software Defined Networks 3. Network Management and Performance Evaluation 4. Cloud Computing	25	75	3	0	0	3
PE-2	1. Internet of Things 2. Embedded Systems 3. Distributed Systems and security 4. Database Security	25	75	3	0	0	3
OE-1	<b>*Open Elective – 1</b>	25	75	3	0	0	3
Laboratory I	Algorithms and Information Security Lab	25	75	0	0	3	2
Seminar I	Seminar-I	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

**II Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-4	Network Programming	25	75	4	0	1	4
PC-5	Wireless Networks	25	75	4	0	1	4
PC-6	IT Security-Threats and Vulnerability	25	75	4	0	1	4
PE-3	1. Internet Technologies and Services 2. Digital Water Marking and Steganography 3. Big Data 4. Network Security Standards and Applications Evaluation	25	75	3	0	0	3
PE4	1. Storage Area Networks 2. Ethical Hacking 3. Cyber Security 4. Information Systems control and Audit	25	75	3	0	0	3
OE-2	<b>*Open Elective – 2</b>	25	75	3	0	0	3
Laboratory II	Network Programming Lab	25	75	0	0	3	2
Seminar II	Seminar -II	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

**III Semester**

<b>Course Title</b>	<b>Int. marks</b>	<b>Ext. marks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
Technical Paper Writing	100	0	0	3	0	2
Comprehensive Viva-Voce	0	100	0	0	0	4
Project work Review I	100	0	0	0	22	8
<b>Total</b>	<b>200</b>	<b>100</b>	<b>0</b>	<b>3</b>	<b>22</b>	<b>14</b>

**IV Semester**

<b>Course Title</b>	<b>Int. marks</b>	<b>Ext. marks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
Project work Review II	100	0	0	0	24	8
Project Evaluation (Viva-Voce)	0	200	0	0	0	16
<b>Total</b>	<b>100</b>	<b>200</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>24</b>

**\*Open Elective subjects must be chosen from the list of open electives offered by various departments.**

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year - I Sem. (CNIS)

### ADVANCED ALGORITHMS

#### Course Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field
- Various aspects of algorithm development
- Qualities of a good solution

**Unit - I : Introduction** - Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Strassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis.

**Unit - II: Review of Data Structures-** Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

**Unit - III: Dynamic Programming** - Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms - Elements of the greedy strategy, Huffman codes, Amortized Analysis - Aggregate analysis, The accounting method, The potential method, Dynamic tables.

**Unit - IV: Graph Algorithms** - Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

**Unit - V: NP-Complete & Approximate Algorithms**-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems - Clique problem, Vertex-cover problem, formula satisfiability, 3 CNF Satisfiability, The vertex-cover problem, The traveling-salesman problem, The subset-sum problem.

#### TEXT BOOKS:

1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third *Edition*, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

#### REFERENCES:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication
2. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
3. Data structures and Algorithm Analysis in C++, 3<sup>rd</sup> edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2<sup>nd</sup> edition, PHI.

# **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

## **M. Tech. I Year - I Sem. (CNIS)**

### **COMPUTER NETWORKING**

#### **UNIT-1**

The internet architecture, Access Networks, The network Core, Peer-to-Peer Networks, Content Distribution Networks, Delay Tolerant Networks, Circuit Switching vs. Packet switching, Packet switching Delays and congestion, Client/Server and Peer-to-Peer Architectures, MAC and LLC, Virtual LAN, Asynchronous Transfer Mode (ATM)

#### **UNIT-2**

Network Address Translator, Internet Control Message Protocol, SNMP, CIDR, IPv6, Routing Protocol Basics in advanced networks, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Switching Services, Spanning Tree Protocol (STP), Standard Network Management Protocol.

#### **UNIT-3**

TCP and Mobile TCP, TCP Tahoe and TCP Reno, High speed TCP, Coexistence of UDP and TCP flows, HTTP and HTTPS, FTP and SFTP, Domain Name Service, TCP and UDP sockets

#### **UNIT-4**

Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Delay Analysis, Connectivity and Availability, Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet.

Introduction, Wireless Links and Network Characteristics, CDMA, WiFi: 802.11, Wireless LANs, The 802.11 Architecture, The 802.11 MAC Protocol, The IEEE 802.11 Frame, Mobility in the Same IP Subnet, Advanced Features in 802.11, Personal Area Networks: Bluetooth and Zigbee, Cellular Internet Access, An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular Subscribers, On to 4G: LTE, Mobility Management: Principles, Addressing, Routing to a Mobile Node, Mobile IP, Managing Mobility in Cellular Networks, Routing Calls to a Mobile User, Handoffs in GSM, Wireless and Mobility: Impact on Higher-Layer Protocols

#### **UNIT-5**

Explaining IP Multicasting, VOIP, Unified Communication, Virtual Networking, Data center Networking, Introduction to Optical Networking, SONET /SDH Standard, Next generation cellular networks, Secure Socket Layer, IP Sec, TLS, Kerberos, Domain name system Protection.

#### **TEXT BOOKS:**

1. Computer Networking: A Top-Down Approach, 6/e, James F. Kurose and Keith W. Ross, Pearson Education, 2012.
2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A systems approach, Morgan Kaufman, 5th Edition, 2012
3. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill
4. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings*, Second Edition, Pearson Education.
5. Top-Down Network Design, *Priscilla Oppenheimer*, Second Edition, Pearson Education (CISCO Press)

## REFERENCE BOOKS:

1. Advance Computer Network, By Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, Wiley India
2. CCNA Intro – Study Guide – Todd Lammle, Sybex
3. Computer Networks by Mayank Dave, Cengage.
4. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson*, Fifth Edition, Thomson.
5. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
6. An Engineering Approach to Computer Networking, *S.Keshav*, Pearson Education.
7. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet*, Pearson Education (CISCO Press)
8. Computer Communications Networks, Mir, Pearson Education.
9. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to computer networks and Cyber Security, CRC press, Taylor & Francis Group, 2014
10. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5<sup>th</sup> Edition, 2014
11. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year - I Sem. (CNIS)

### CRYPTOGRAPHY AND NETWORK SECURITY

#### Course Objectives:

- Understand the basic categories of threats to computers and networks
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

#### Course Outcomes:

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security

#### UNIT – I

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

#### UNIT – II

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

#### UNIT – III

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512),

**Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

#### UNIT – IV

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

## **UNIT – V**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### **TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 3<sup>rd</sup> Edition

### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, Cengage Learning
6. Network Security and Cryptography: Bernard Menezes, Cengage Learning

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year - I Sem. (CNIS)

### PRIVACY AND SECURITY IN CYBER SPACE (Professional Elective-I)

#### Course Objectives:

- To understand the computer security fundamentals
- To understand the integrity policies
- To understand system, user, program security issues

#### UNIT - I

**An Overview of Computer Security:** The Basic Components, Threats, Policy and Mechanism, Assumptions and Trust, Assurance, Operational Issues, Human Issues. Security Policies: Security Policies, Types of Security Policies, The Role of Trust, Types of Access Control, Example: Academic Computer Security Policy, General University Policy, Electronic Mail Policy, Confidentiality Policies: Goals of Confidentiality Policies, The Bell-LaPadula Model, Informal Description, Example: The Data General B2 UNIX System.

#### UNIT - II

**Integrity Policies:** Goals, Biba Integrity Model, Clark-Wilson Integrity Model, The Model, Comparison with the Requirements, Comparison with Other Models, Hybrid Policies: Chinese Wall Model, Bell-LaPadula and Chinese Wall Models, Clark-Wilson and Chinese Wall Models, Clinical Information Systems Security Policy, Bell-LaPadula and Clark-Wilson Models, Originator Controlled Access Control, Role-Based Access Control.

**Design Principles:** Overview, Design Principles, Principle of Least Privilege, Principle of Fail-Safe Defaults, Principle of Economy of Mechanism, Principle of Complete Mediation, Principle of Open Design, Principle of Separation of Privilege, Principle of Least Common Mechanism, Principle of Psychological Acceptability.

#### UNIT - III

**System Security:** Introduction, Policy: The Web Server System in the DMZ, The Development System, Networks: The Web Server System in the DMZ, The Development System, Users: The Web Server System in the DMZ, The Development System, Authentication: The Web Server System in the DMZ, Development Network System.

#### UNIT - IV

**User Security:** Policy, Access: Passwords, The Login Procedure, Trusted Hosts, Leaving the System, Files and Devices: Files, File Permissions on Creation, Group Access, File Deletion, Devices, Writable Devices, Smart Terminals, Monitors and Window Systems, Processes: Copying and Moving Files, Accidentally Overwriting Files, Encryption, Cryptographic Keys, and Passwords, Start-up Settings, Limiting Privileges, Malicious Logic.

#### UNIT - V

**Program Security:** Introduction, Common Security-Related Programming Problems, Improper Choice of Initial Protection Domain, Improper Isolation of Implementation Detail, Improper Change, Improper Naming, Improper Deallocation or Deletion, Improper Validation, Improper Indivisibility, Improper Sequencing, Improper Choice of Operand or Operation, Testing, Maintenance, and Operation.



**TEXT BOOK:**

1. "Introduction to Computer Security", Matt Bishop, Sathyanarayana S. Venkatramanayya, Pearson Education.

**REFERENCES:**

1. "Computer Security", Dieter Gollmann, Wiley India.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year - I Sem. (CNIS)

### SOFTWARE DEFINED NETWORKS (Professional Elective-I)

#### Course Objectives:

- This course provides a comprehensive introduction to Software Defined Networking (SDN) and presents SDN in context with more familiar network services and challenges
- It also offers a unique perspective of the business case and technology motivations for considering SDN solutions.
- It identifies the impact of SDN on traffic management and the potential for network service growth
- Instills the knowledge needed to manage current and future demand and provisioning for SDN
- It provides students with the basic concepts and explains the importance of virtualization, particularly the impact of virtualization on servers and networks
- It also introduces students with the impact on 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, Storage Virtualization, Software Defined Networking, Network Limitations, Network Control Plane.

#### 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

#### 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 Evolution** Introduction, SDN and Enterprise Networks, SDN and Transport Networks, SDN and Optical Transport Networks, Increasing WAN Utilization with SDN, SDN Scalability Issues, Controller Designs for Scalability, Potential SDN Scalability Issues, Network Types, 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, 1st Edition Patricia A. Morreale and James M. Anderson, CRC press.
2. SDN: Software Defined Networks, Thomas D. Nadeau and Ken Gray, Orielly media

**REFERENCE BOOKS:**

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

# **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

## **M. Tech. CNIS - I Year - I Sem**

### **NETWORK MANAGEMENT AND PERFORMANCE EVALUATION (Professional Elective-I)**

#### **Course Objectives:**

- To describe bridging/switching technologies and apply them to network design.
- To apply algorithms to solve network design problems.
- To analyze network traffic flow and evaluate its performance.
- To demonstrate understanding of network management standards, SNMP.

#### **UNIT - I**

Introduction to Network Management: 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**

SNMP v1 Network Management: Organization and Information Models : The History of SNMP Management The SNMP Mode, The Organization Model, System Overview, The Information Model. The SNMP Communication Model, Functional model

SNMP Management: SNMP v2

Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information , The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMP v1

#### **UNIT - III**

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, and Enterprise Management Solutions

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,

#### **UNIT - IV**

WBEM: Windows Management Instrumentation. Java management Extensions, Management of a Storage Area Network: Future Directions

Performance Modeling and Estimation: Overview of Probability and Stochastic Processes – Probability, Random Variables Stochastic Processes, Queuing Analysis - How Queues Behave—A Simple Example Why Queuing Analysis. Queuing Models, Single-Server Queues. Multi server Queues, Examples, Queues with Priorities, Networks of Queues, Other Queuing Models. Estimating Model Parameters

#### **UNIT - V**

Modeling and Estimation of Self-Similar Traffic : Self-Similar Traffic - Self-Similarity, Self-Similar Data Traffic, Examples of Self-Similar Data Traffic, Performance Implications of Self-Similarity. Modeling and Estimation of Self-Similar Data Traffic

Quality of Service in IP Networks : Exterior Routing Protocols and Multicast - Path-Vector Protocols: BGP and IDRP. Multicasting, Integrated and Differentiated Services - Integrated Services Architecture (ISA), Queuing Discipline, Random Early Detection. Differentiated Services, Protocols for QOS Support - Resource Reservation: RSVP. Multi protocol Label Switching, Real-Time Transport Protocol (RTP)

**TEXT BOOKS:**

1. Mani Subramanian, "Network Management, Principles and Practice", Pearson Education, 2000, rp 2007.
2. William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service – 2ed", Prentice Hall/Pearson Education, 2002.

**REFERENCES BOOKS:**

1. Benoit Claise and Ralf Wolter, "Network Management: Accounting and Performance Strategies", Pearson Education, 2007, rp2008.
2. J. Richard Burke, "Network Management – Concepts and Practice: A Hands-on Approach", PHI, 2004, rp2008.
3. Stephen B. Morris, "Network Management, MIBs and MPLS", Pearson Education, 2003, rp 2008.
4. Anurag Kumar, D. Manjunath and Joy Kuri, "Communication Networking: An Analytical Approach", Elsevier, 2004.
5. Engineering Internet Qos, Sanjay Jha and Mahbub Hassan, Artech House, 2002
6. Thomas G. Robertazzi, "Computer Networks and Systems – Queuing Theory and Performance Evaluation – 3ed", Springer, 2000, rp2002.
7. Gary N. Higgin bottom, "Performance Evaluation of Communication Networks", Artech House, 1998.

# **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

## **M. Tech. I Year - I Sem. (CNIS)**

### **CLOUD COMPUTING (Professional Elective- I)**

#### **Course Objectives:**

- To learn the new computing model which enables shared resources on demand over the network.
- To learn about the pay-per-use scenarios.
- To learn about the new kind of service models and deployment models.
- To learn about the virtualization technology.
- To learn the python programming or various services and models.
- To develop cloud applications in Python

#### **UNIT-I**

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Map Reduce.

#### **UNIT –II**

Cloud Platforms for Industry, Healthcare and education, Cloud Platforms in the Industry, cloud applications.

Virtualization, cloud virtualization technology, deep dive: cloud virtualization, Migrating in to cloud computing, Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems,

#### **UNIT-III**

Cloud computing Applications: Industry, Health, Education, Scientific Applications, Business and Consumer Applications, Understanding Scientific Applications for Cloud Environments, Impact of Cloud computing on the role of corporate IT.

Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

#### **UNIT-IV**

Python Basics, Python for cloud, cloud application development in python, Cloud Application Development in Python.

Programming Google App Engine with Python: A first real cloud Application, Managing Data in the cloud, Google app engine Services for Login Authentication, Optimizing UI and Logic, Making the UI Pretty: Templates and CSS, Getting Interactive. Map Reduce Programming Model and Implementations.

#### **UNIT-V**

Cloud management, Organizational Readiness and change management in the cloud age, Cloud Security, Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services

#### **TEXT BOOKS:**

1. Cloud Computing: Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola, selvi-2013.

3. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
4. Cloud computing: Dr Kumar Saurab Wiley India 2011.

**REFERENCES:**

1. Code in the Cloud: Mark C. Chu-Carroll 2011, SPD. (Second part of IV UNIT)
2. Essentials of cloud computing: K Chandrasekharan, CRC Press.
3. Cloud Computing: John W. Rittinghouse, James Ransome, CRC Press.
4. Cloud Security and Privacy: Mather, Kumara swamy and Latif. 2011. SPD, Oreilly.
5. Virtualization Security: Dave shackleford 2013. SYBEX a wiley Brand.
6. Cloud Computing Bible: Sosinsky 2012. Wiley India.
7. Cloud Computing: Dan C. Marinescu-2013, Morgan Kaufmann.
8. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
9. Fundamentals of Python Kenneth A. Lambert, B.L. Juneja

# **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

## **M. Tech. I Year - I Sem. (CNIS)**

### **INTERNET OF THINGS (Professional Elective- II)**

#### **Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

#### **Unit - I**

Introduction to Internet of Things –Definition and Characteristics of IoT,  
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs  
IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,  
Communication protocols, Embedded Systems, IoT Levels and Templates  
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry,  
health and Lifestyle

#### **Unit - II**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN  
and NFV for IoT  
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

#### **Unit - III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow,  
functions, modules, packaging, file handling, data/time operations, classes, Exception handling  
Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

#### **Unit - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)  
Programming – Python program with Raspberry PI with focus of interfacing external gadgets,  
controlling output, reading input from pins.

#### **Unit - V**

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication  
APIs  
Webserver – Web server for IoT, Cloud for IoT, Python web application framework  
Designing a RESTful web API

#### **TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech- - I Year - I Sem. (CNIS)**

**EMBEDDED SYSTEMS  
(Professional Elective- II)**

**Course Objectives:**

- To explain various embedded system applications and design requirements.
- To construct embedded system hardware.
- To develop software programs to control embedded system.
- To generate product specification for embedded system.

**UNIT - I**

**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems

**UNIT - II**

**8051 and Advanced Processor Architecture:** 8051 Architecture, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts, Introduction to Advanced Architectures, Real World Interfacing, Processor and Memory organization - **Devices and Communication Buses for Devices Network:** Serial and parallel Devices & ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems, Wireless and Mobile System protocols

**UNIT - III**

**Embedded Programming Concepts:** Software programming in Assembly language and High Level Language, Data types, Structures, Modifiers, Loops and Pointers, Macros and Functions, object oriented Programming, Embedded Programming in C++ & JAVA

**UNIT - IV**

**Real – Time Operating Systems:** OS Services, Process and Memory Management, Real – Time Operating Systems, Basic Design Using an RTOS, Task Scheduling Models, Interrupt Latency, Response of Task as Performance Metrics - **RTOS Programming:** Basic functions and Types of RTOSes, RTOS VxWorks, Windows CE

**UNIT - V**

**Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-Design - **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine, Simulators, Laboratory Tools

**TEXT BOOK:**

1. Embedded Systems, Raj Kamal, Second Edition TMH.

**REFERENCE BOOKS:**

1. Embedded/Real-Time Systems, Dr. K.V.K.K. Prasad, dream Tech press
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
3. The 8051 Microcontroller, Third Edition, Kenneth J. Ayala, Thomson.

4. An Embedded Software Primer, David E. Simon, Pearson Education.
5. Micro Controllers, Ajay V Deshmukhi, TMH.
6. Microcontrollers, Raj Kamal, Pearson Education.
7. Introduction to Embedded Systems, Shibu K. V, TMH.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. I Year - I Sem. (CNIS)**

**Distributed Systems and security (Professional Elective – II)**

**Course Objectives:**

- To learn about the distributed systems and security
- To learn about the host-level, application level threats and vulnerabilities
- To learn about service –level solutions

**UNIT - I**

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

**UNIT - II**

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

**UNIT- III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOK:**

1. Abhijit Belapurkar, Anirban Chakrabarti and et al., “Distributed Systems Security: Issues. Processes and solutions”, Wiley, Ltd., Publication, 2009.

**REFERENCES:**

1. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnappalli, Niranjana Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarajan, “Distributed Systems Security: Issues, Processes and Solutions”, Wiley publications, 2009.

2. Rachid Guerraoui and Franck Petit, "Stabilization, Safety, and Security of Distributed Systems", Springer, 2010.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. I Year - I Sem. (CNIS)**

**DATABASE SECURITY**  
**(Professional Elective - II)**

**Course Objectives:**

- To learn the security of databases
- To learn the design techniques of database security
- To learn the secure software design

**Course Outcomes:**

- Ability to carry out a risk analysis for large database.
- Ability to set up, and maintain the accounts with privileges and roles.

**UNIT- I**

**Introduction:** Introduction to Databases Security Problems in Databases Security Controls Conclusions

**Security Models -1:** Introduction Access Matrix Model Take-Grant Model Acten Model PN Model Hartson and Hsiao's Model Fernandez's Model Bussolati and Martella's Model for Distributed databases

**UNIT-II**

**Security Models -2:** Bell and LaPadula's Model Biba's Model Dion's Model Sea View Model Jajodia and Sandhu's Model The Lattice Model for the Flow Control conclusion

**Security Mechanisms:** Introduction User Identification/Authentication Memory Protection Resource Protection Control Flow Mechanisms Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria

**UNIT- III**

**Security Software Design:** Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

**Statistical Database Protection & Intrusion Detection Systems:** Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

**UNIT- IV**

**Models for the Protection of New Generation Database Systems -1:** Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems SORION Model for the Protection of Object-Oriented Databases

**UNIT- V**

**Models for the Protection of New Generation Database Systems -2:** A Model for the Protection of New Generation Database Systems: the Orion Model ajodia and Kogan's Model A Model for the Protection of Active Databases Conclusions

**TEXT BOOK:**

1. Database Security by Castano Pearson Edition (lie) Database Security and Auditing: Protecting Data Integrity and Accessibility, 1st Edition, Hassan Afyouni, THOMSON Edition.

**REFERENCE BOOK:**

1. Database security by alfred basta, melissazgola, CENGAGE learning.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year - I Sem. (CNIS)**

**ALGORITHMS LAB  
PART-I**

**Course Objectives:**

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.

**Sample Problems on Data structures:**

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
  - a) Linear search
  - b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
  - a) List ADT
3. Write Java programs to implement the following using an array.
  - a) Stack ADT
  - b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
  - a) Stack ADT
  - b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
  - a) Array
  - b) Singly linked list
  - c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
  - a) Construct a binary search tree of elements.
  - b) Search for a key element in the above binary search tree.
  - c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
  - a) Preorder
  - b) Inorder
  - c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
  - a) Bubble sort
  - b) Insertion sort
  - c) Quick sort
  - d) Merge sort
  - e) Heap sort
  - f) Radix sort
  - g) Binary tree sort
16. Write a Java program to perform the following operations:
  - a) Insertion into a B-tree
  - b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

**REFERENCE BOOKS:**

1. Data Structures and Algorithms in java, 3<sup>rd</sup> edition, A. Drozdek, Cengage Learning.

2. Data Structures with Java, J. R. Hubbard, 2<sup>nd</sup> edition, Schaum's Outlines, TMH.
3. Data Structures and algorithms in Java, 2<sup>nd</sup> Edition, R. Lafore, Pearson Education.
4. Data Structures using Java, D.S. Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P. H. Dave and H. B. Dave, Pearson education.
7. Data Structures and java collections frame work, W.J. Collins, Mc Graw Hill.
8. Java: the complete reference, 7<sup>th</sup> edition, Herbert Schildt, TMH.
9. Java for Programmers, P. J. Deitel and H.M. Deitel, Pearson education / Java: How to Program P. J. Deitel and H.M. Deitel , 8<sup>th</sup> edition, PHI.
10. Java Programming, D.S. Malik, Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S. Goldman & K. Goldman, Chapman & Hall/CRC, Taylor, & Francis Group.

**(Note: Use packages like java.io, java.util, etc)**

## **PART-II**

### **INFORMATION SECURITY LAB**

#### **Course Objectives:**

- To implement the cryptographic algorithms
- To implement the security algorithms.
- To implement cryptographic, digital signatures algorithms.

#### **List of Experiments:**

1. Implementation of symmetric cipher algorithm(AES and RC4)
2. Random number generation using a subset of digits and alphabets.
3. Implementation of RSA based signature system
4. Implementation of Subset sum
5. Authenticating the given signature using MD5 hash algorithm.
6. Implementation of Diffie-Hellman algorithm
7. Implementation EIGAMAL cryptosystem.
8. Implementation of Goldwasser-Micali probabilistic public key system
9. Implementation of Rabin Cryptosystem. (Optional).
10. Implementation of Kerberos cryptosystem
11. Firewall implementation and testing.
12. Implementation of a trusted secure web transaction.
13. Cryptographic Libraries-Sun JCE/Open SSL/Bouncy Castle JCE.
14. Digital Certificates and Hybrid (ASSY/SY) encryption, PKI.
15. Message Authentication Codes.
16. Elliptic Curve cryptosystems (Optional)
17. PKCS Standards (PKCS1, 5, 11, 12), Cipher modes.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M.Tech in Computer Networks and Information Security (CNIS)  
Common to (Computer Networks, CNIS)**

**EFFECTIVE FROM ACADEMIC YEAR 2017- 18 ADMITTED BATCH**

**COURSE STRUCTURE AND SYLLABUS**

**I Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-1	Advanced Algorithms	25	75	4	0	0	4
PC-2	Computer Networking	25	75	4	0	0	4
PC-3	Cryptography and Network Security	25	75	4	0	0	4
PE-1	1. Privacy and Security in Cyber Space 2. Software Defined Networks 3. Network Management and Performance Evaluation 4. Cloud Computing	25	75	3	0	0	3
PE-2	1. Internet of Things 2. Embedded Systems 3. Distributed Systems and security 4. Database Security	25	75	3	0	0	3
OE-1	<b>*Open Elective – 1</b>	25	75	3	0	0	3
Laboratory I	Algorithms and Information Security Lab	25	75	0	0	3	2
Seminar I	Seminar-I	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

**II Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-4	Network Programming	25	75	4	0	0	4
PC-5	Wireless Networks	25	75	4	0	0	4
PC-6	IT Security-Threats and Vulnerability	25	75	4	0	0	4
PE-3	1. Internet Technologies and Services 2. Digital Watermarking and Steganography <b>3. Big Data Analytics</b> 4. Network Security Standards and Applications Evaluation	25	75	<b>3</b>	0	0	3
PE4	1. Storage Area Networks 2. Ethical Hacking 3. Cyber Security 4. Information Systems control and Audit	25	75	<b>3</b>	0	0	3
OE-2	<b>*Open Elective – 2</b>	25	75	3	0	0	3
Laboratory II	Network Programming Lab	25	75	0	0	3	2
Seminar II	Seminar -II	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>



### III Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Technical Paper Writing	100	0	0	3	0	2
Comprehensive Viva-Voce	0	100	0	0	0	4
Project work Review II	100	0	0	0	22	8
<b>Total</b>	<b>200</b>	<b>100</b>	<b>0</b>	<b>3</b>	<b>22</b>	<b>14</b>

### IV Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Project work Review III	100	0	0	0	24	8
Project Evaluation (Viva-Voce)	0	100	0	0	0	16
<b>Total</b>	<b>100</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>24</b>

**\*Open Elective subjects must be chosen from the list of open electives offered by OTHER departments.**

**# For Project review I, please refer 7.10 in R17 Academic Regulations.**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech – CN/CNIS - I Year - II Sem**

**NETWORK PROGRAMMING (PC – 4)**

**Course Objectives:**

- To understand to Linux utilities
- To understand file handling, signals
- To understand IPC, network programming in Java
- To understand processes to communicate with each other across a Computer Network.

**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.

Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

**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.

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 - III**

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.

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.

**UNIT – IV**

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.

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.

## **UNIT-V**

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

### **TEXT BOOKS:**

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java Network Programming,3<sup>rd</sup> edition, E.R. Harold, SPD, O'Reilly.(Unit V)

### **REFERENCE BOOKS:**

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2<sup>nd</sup> Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3<sup>rd</sup> Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4<sup>th</sup> Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3<sup>rd</sup> edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech – CN/CNIS - I Year - II Sem**

**WIRELESS NETWORKS (PC – 5)**

**Course Objectives:**

- To identify the principal components of telecommunications networks and key networking technologies.
- To implement how the Internet and Internet technology works.
- To identify the principal technologies and standards for wireless networking, communication, and Internet access.
- To describe troubleshooting techniques for wireless networks.

**UNIT - I**

Overview of Wireless Networks: Introduction, Different generations of wireless networks. Characteristics of The Wireless Medium: Introduction, radio propagation mechanisms, path-loss modeling and signal coverage, effects of multi path and Doppler, channel measurement and modeling techniques.

**UNIT - II**

Physical Layer Alternatives for Wireless Networks: Introduction, applied wireless transmission techniques, short distance base band transmission, UWB pulse transmission, Carrier Modulated transmission, Broadband modems for higher speeds, Spread Spectrum transmissions, High-speed Modems for Spread spectrum technology, Diversity and Smart Receiving Techniques, Comparison of modulation schemes, Coding techniques for wireless communications.

**UNIT - III**

Wireless Medium Access Alternatives: Introduction, fixed-assignment access for Voice-Oriented networks, Random access for Data-Oriented Networks, Integration of Voice and Data Traffic. Network Planning: Introduction, wireless network topologies, Cellular Topology, Cell Fundamentals, Signal-to-interference ratio calculation, capacity Expansion Techniques, network planning for CDMA systems.

**UNIT - IV**

Wireless Network Operation: Introduction, mobility management, radio resources and power management, security in wireless networks. Wireless Application Protocol: Design and Principles of Operation, WAP Architecture & Components, WAE Overview, WAE Model, WTA Architecture, WTA Framework Components, WSP Specification, WTP Specification, WTLS Specification, WDP Specification

**UNIT - V**

Bluetooth Design and Principles of Operation, Transmitter Characteristics, Bluetooth Security, Link Manager Protocol, Logical Link Control and Adaptation Layer Protocol, Alternatives to Bluetooth. WIRELESS LANs: Benefits of WLANs, Design and principles of Operation, WLAN Configurations, Microcells and Roaming, Types of WLANS, IEEE802.11, IEEE802.11a, IEEE802.11b

**TEXT BOOKS:**

1. Kaveh Pahlavan and Prashant Krishnamurthy, "Principles of Wireless Networks-a Unified approach", Pearson, 2004.
2. Gary S.Rogers et al, "An Introduction to Wireless Technology", Pearson, 2007.

**REFERENCE BOOKS:**

1. William Stallings, "Wireless communications and Networks", Pearson education, 2005, ISBN 81-7808-560-7

- 2 Jim Geier, "Wireless Networks first-step", Pearson, 2005.
- 3 Sumit Kasera et al, "2.5G Mobile Networks: GPRS and EDGE", TMH, 2008.
- 4 Matthew S.Gast, "802.11 Wireless Networks", O'Reilly, Second Edition, 2006.
5. Theodore s. Rappaport, "Wireless Communications –principles and practice", second edition, PHI, 2002
6. C.S.R.Prabhu et al, "Bluetooth Technology and its Applications with Java and J2ME", PHI, 2007.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech – CN/CNIS - I Year - II Sem**

**IT SECURITY – THREATS AND VULNERABILITY (PC – 6)**

**UNIT-1**

**Information Security**

Introduction, How Much of Our Daily Lives Relies on Computers, Security Truisms, Basic Security, Terminology, Cyber Ethics, The Perception of Security, Threat Model, Security Is a Multidisciplinary Topic, Security Role-Playing Characters

**UNIT – II**

**Passwords under Attack**

Introduction, Authentication Process, Password Threats, Strong Passwords, Password Management.

**Email Security** – Introduction, Email Systems, Email Security and Privacy

**UNIT- III**

**Malware The Dark Side of Software**, What Is Malware?, How Do I Get Malware?, What Does Malware Do?, **Malware: Defense in Depth**, Introduction, Data Backup, Firewalls, Software Patches, Antivirus Software, User Education

**Securely Surfing the World Wide Web**

Introduction, Web Browser, "HTTP Secure", Web Browser History, **Online Shopping**, Consumer Decisions, Spyware and Key-Loggers, Wireless Sniffing, Scams and Phishing Websites, Misuse and Exposure of Information

**UNIT- IV**

**Wireless Internet Security**

Introduction, How Wireless Networks Work, Wireless Security Threats, Public Wi-Fi Security, Wireless Network Administration

**Social Networking**

Introduction, Choose Your Friends Wisely, Information Sharing, Malware and Phishing

**UNIT- V**

**Social Engineering: Phishing for Suckers**

Introduction, Social Engineering: Malware Distribution, Phishing, Detecting a Phishing URL, Application of Knowledge

**Staying Safe Online: The Human Threat**

Introduction, The Differences between Cyberspace and the Physical World, Consider the Context: Watch What You Say and How It Is Communicated, What You Do on the Internet Lasts Forever, Nothing Is Private, Now or in the Future, Can You Really Tell Who You Are Talking with?, Cameras and Photo Sharing, I Am a Good Person, That Would Never Happen to Me, Is There Anything I Can Do to Make the Internet a Safer Place for My Child?

**TEXTBOOKS**

1. Douglas Jacobson, Joseph Idziorek, "Computer Security Literacy: Staying Safe in a Digital World", CRC Press

**REFERENCES**

1. Elementary Information Security, 2/e by Richard E Smith
2. Hacker Techniques, Tools, and Incident Handling, 2/e by Sean Philip Oriyano
3. Fundamentals of Information Systems Security, 3/e by David Kim & Michael G. Solomon
4. Internet Security: How to Defend Against Attackers on the Web, 2/e by Mike Harwood

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech – CN/CNIS - I Year - II Sem**

**INTERNET TECHNOLOGIES AND SERVICES (PE - III)**

**Course Objective:**

The student who has knowledge of programming with java should be able to develop web based solutions using multi-tier architecture. S/he should have good understanding of different technologies on client and server side components as Follows:

Client Side: HTML5, CSS3, Javascript, Ajax, JQuery and JSON

Server Side: Servlets, JSP

Database: MySQL with Hibernate and Connection Pooling

Framework: Struts with validation framework, Internationalization (I18N)

SOA: Service Oriented Architecture, Web services fundamentals, Axis framework for WS

**UNIT- I**

**Client Side Technologies:** Overview of HTML - Common tags, XHTML, capabilities of HTML5  
Cascading Style sheets, CSS3 enhancements, linking to HTML Pages, Classes in CSS  
Introduction to JavaScripts, variables, arrays, methods and string manipulation, BOM/DOM (Browser/Document Object Model), accessing elements by ID, Objects in JavaScript  
Dynamic HTML with JavaScript and with CSS, form validation with JavaScript, Handling Timer Events  
Simplifying scripting with JQuery, JASON for Information exchange.

**UNIT - II**

**Introduction to Java Servlets:** Introduction to Servlets: Lifecycle of a Servlet, Reading request and initialization parameters, Writing output to response, MIME types in response, Session Tracking: Using Cookies and Sessions  
Steps involved in Deploying an application  
Database Access with JDBC and Connection Pooling  
Introduction to XML, XML Parsing with DOM and SAX Parsers in Java  
Ajax - Ajax programming with JSP/Servlets, creating XML Http Object for various browsers, Sending request, Processing response data and displaying it.  
Introduction to Hibernate

**UNIT - III**

**Introduction to JSP:** JSP Application Development: Types of JSP Constructs (Directives, Declarations, Expressions, Code Snippets), Generating Dynamic Content, Exception Handling, Implicit JSP Objects, Conditional Processing, Sharing Data Between JSP pages, Sharing Session and Application Data, Using user defined classes with jsp:useBean tag, Accessing a Database from a JSP

**UNIT - IV**

**Introduction to Struts Framework:** Introduction to MVC architecture, Anatomy of a simple struts2 application, struts configuration file, Presentation layer with JSP, JSP bean, html and logic tag libraries, Struts Controller class, Using form data in Actions, Page Forwarding, validation frame work, Internationalization

**UNIT - V**

**Service Oriented Architecture and Web Services** Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of a SOA  
Introduction to Web Services– The definition of web services, basic operational model of web services, basic steps of implementing web services.

Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models,

Describing Web Services –Web Services life cycle, anatomy of WSDL

Introduction to Axis– Installing axis web service framework, deploying a java web service on axis.

Web Services Interoperability – Creating java and .Net client applications for an Axis Web Service

(Note: The Reference Platform for the course will be open source products Apache Tomcat Application Server, MySQL database, Hibernate and Axis)

#### **TEXT BOOKS:**

1. Web Programming, building internet applications, Chris Bates 3<sup>rd</sup> edition, WILEY Dreamtech .
2. The complete Reference Java 7<sup>th</sup> Edition , Herbert Schildt., TMH.
3. Java Server Pages,Hans Bergsten, SPD, O'Reilly.
4. Professional Jakarta Struts - James Goodwill, Richard Hightower, Wrox Publishers.
5. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India, rp – 2008.
6. Understanding SOA with Web Services, Eric Newcomer and Greg Lomow, Pearson Edition – 2009
7. Java Web Service Architecture, James McGovern, Sameer Tyagi et al., Elsevier - 2009

#### **REFERENCE BOOKS:**

1. Programming the world wide web,4<sup>th</sup> edition,R.W.Sebesta,Pearson
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE
3. TECHNOLOGIES , Marty Hall and Larry Brown Pearson
4. Internet and World Wide Web – How to program , Dietel and Nieto PHI/Pearson.
5. Jakarta Struts Cookbook , Bill Siggelkow, S P D O'Reilly.
6. Professional Java Server Programming,S.Allamaraju & othersApress(dreamtech).
7. Java Server Programming ,Ivan Bayross and others,The X Team,SPD
8. Web Warrior Guide to Web Programmimg-Bai/Ekedaw-Cengage Learning.
9. Beginning Web Programming-Jon Duckett ,WROX.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M.Tech – CN/CNIS - I Year - II Sem**

**DIGITAL WATERMARKING AND STEGANOGRAPHY (PE - III)**

**Course Objectives:**

- To learn about the watermarking models and message coding
- To learn about watermark security and authentication.
- To learn about steganography. Perceptual models

**UNIT - I**

**INTRODUCTION:** Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems

**WATERMARKING MODELS & MESSAGE CODING:** Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

**WATERMARK SECURITY & AUTHENTICATION:** Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.

**UNIT - V**

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

**REFERENCES:**

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, New York, 2008.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, "Digital Watermarking", Morgan Kaufmann Publishers, New York, 2003.
3. Michael Arnold, Martin Schmucker, Stephen D. Wolthusen, "Techniques and Applications of Digital Watermarking and Content Protection", Artech House, London, 2003.
4. Juergen Seits, "Digital Watermarking for Digital Media", IDEA Group Publisher, New York, 2005.
5. Peter Wayner, "Disappearing Cryptography – Information Hiding: Steganography & Watermarking", Morgan Kaufmann Publishers, New York, 2002.

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**BIG DATA ANALYTICS (PE - III)**

**Course Objectives:**

- To understand about big data
- To learn the analytics of Big Data
- To Understand the MapReduce fundamentals

**UNIT - I**

Big Data Analytics : What is big data, History of Data Management ; Structuring Big Data ; Elements of Big Data ; Big Data Analytics; Distributed and Parallel Computing for Big Data;

**Big Data Analytics:** What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools

**UNIT- II**

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics; Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

**UNIT - III**

**Understanding MapReduce Fundamentals and HBase :** The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations- Programming with HBase; Installation, Combining HBase and HDFS;

**UNIT - IV**

**Big Data Technology Landscape and Hadoop :** NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFS (Hadoop Distributed File System), HDFS Daemons, read,write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

**UNIT - V**

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools;

**TEXT BOOKS**

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black Book™, DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e, BY Albright |Winston

**REFERENCE BOOKS:**

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence –Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, “ Business Intelligence Roadmap”, Addison-Wesley It Service.
3. Yuli Vasiliev, “ Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012

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**NETWORK SECURITY STANDARDS AND APPLICATIONS EVALUATION (PE - III)**

**Course Objectives:**

- Compile, analyze, and assess the applicability of best practices in addressing information security issues relevant to the cyber security community
- Evaluate the impact of business constraints and processes on the implementation of network security programs
- Integrate principles and techniques of risk analysis, project planning and change management in the development of network security strategies
- Demonstrate secondary research skills in the investigation and selection of best practice solutions to address network security challenges
- Demonstrate mastery of theory, concepts and skills in addressing specialized aspects of network security Applications

**UNIT I**

Introduction to Information Security: Introduction, Critical Characteristics, threats to information Security, Attacks on Information Security, Security Professionals and the Organization, Information Security Policies, Standards and Practices, Frameworks for Industry Standards in Information Security.

**UNIT II**

**Auditing, Monitoring, and Logging:** Monitoring Network Systems, Configuration and Change Management,

Introduction to security audits, need for security audits, organizational roles, Auditor's roles, Types of security audits, Audit approaches, Technology based audits ,Auditing (Formal Reviews), Systems Certification, Accreditation and Authorization,

**UNIT III**

**Contingency Planning and Networking Incident Response:** Introduction, What is Contingency Planning?, Incident Response Plan,

**Network Authentication and Remote Access Using VPN:** Introduction, Access Control, Virtual Private Networks.

**UNIT IV**

**Network Monitoring and Intrusion Detection and Prevention Systems:** Introduction, Network monitoring Software : Packet Sniffing, Intrusion Detection and Prevention Systems, Honeypots and Honeynets.

## UNIT V

**Wireless Network Security: Introduction**, Wireless Technologies and Standards, Wireless Architectures and Topologies, Wireless Security Protocols, WLAN Security Concerns, Bluetooth

### TEXT BOOKS:

1. Guide to Network Security by Michael Whitman, Herb Mattord, David Mackey, Andrew Green Cengage Learning
2. Information Systems Security, *Nina Godbole*, Wiley India, 2009
3. Principles and Practices of Information Security. *Michael E. Whitman, Herbert J. Mattord*, Cengage Learning,

### REFERENCES:

1. Microsoft Security Risk Management Guide
2. Risk Management Guide for Information Technology Systems  
<http://csrc.nist.gov/publications/nistpubs/800-30/sp800-30.pdf>
3. OCTAVE approach <http://www.cert.org/octave/>
4. COBIT <http://www.isaca.org/>
5. Guide to Firewalls and Policies (Unit 3) <http://csrc.nist.gov/publications/nistpubs/800-41/sp800-41.pdf>
6. Firewalls and Network Security, Micheal E. Whitman, et al. Cengage Learning, 2008
7. Audit Trails (Unit 7) <http://csrc.nist.gov/publications/nistpubs/800-12/800-12-html/chapter18.html>
8. Information Security Management Handook, Harold F. Tipton, CRC Press, 2012
9. Information Security Policies and Procedures, 2<sup>nd</sup> Edition, Thomas R. Peltier, Auerbach, 2004

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**STORAGE AREA NETWORKS (PE - IV)**

**Course Objectives:**

- To understand Storage Area Networks characteristics and components.
- To become familiar with the SAN vendors and their products
- To learn Fibre Channel protocols and how SAN components use them to communicate with each other
- To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches Thoroughly learn Cisco SAN-OS features.
- To understand the use of all SAN-OS commands. Practice variations of SANOS features

**UNIT- I**

**Introduction to Storage Technology** Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

**UNIT- II**

**Storage Systems Architecture** Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system

**UNIT- III**

**Introduction to Networked Storage** Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfills the need , Understand the appropriateness of the different networked storage options for different application environments

**UNIT - IV**

**Information Availability & Monitoring & Managing Datacenter** List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities  
Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center

**UNIT - V**

**Securing Storage and Storage Virtualization** Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each

domain, Virtualization technologies, block-level and file-level virtualization technologies and processes

### **Case Studies**

The technologies described in the course are reinforced with EMC examples of actual solutions. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

### **TEXT BOOK:**

1. EMC Corporation, Information Storage and Management, Wiley.

### **REFERENCE BOOKS:**

1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

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**ETHICAL HACKING (PE - IV)**

**Prerequisites:**

- A course on “Operating Systems”
- A course on “Computer Networks”
- A course on “Network Security and Cryptography”

**Course Objectives:**

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

**Course Outcomes:**

- Gain the knowledge of the use and availability of tools to support an ethical hack
- Gain the knowledge of interpreting the results of a controlled attack
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
- Comprehend the dangers associated with penetration testing

**UNIT - I**

**Introduction:** Hacking Impacts, The Hacker

**Framework:** Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

**Information Security Models:** Computer Security, Network Security, Service Security, Application Security, Security Architecture

**Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

**UNIT - II**

**The Business Perspective:** Business Objectives, Security Policy, Previous Test Results, Business Challenges

**Planning for a Controlled Attack:** Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

**UNIT - III**

**Preparing for a Hack:** Technical Preparation, Managing the Engagement

**Reconnaissance:** Social Engineering, Physical Security, Internet Reconnaissance

**UNIT - IV**

**Enumeration:** Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

**Exploitation:** Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern



**UNIT - V**

**Deliverable:** The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation

**Integration:** Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

**TEXT BOOK**

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press

**REFERENCE BOOKS**

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning

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**CYBER SECURITY (PE - IV)**

**Course Objectives:**

- To learn about cyber crimes and how they are planned
- To learn the vulnerabilities of mobile and wireless devices
- To learn about the crimes in mobile and wireless devices

**UNIT- I**

**Introduction to Cybercrime:** Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**Cyber offenses: How criminals Plan Them:** Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT- II**

**Cybercrime: 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, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT - III**

**Cybercrimes and Cyber security: the Legal Perspectives**

Introduction. Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

**UNIT - IV**

**Understanding Computer Forensics:** Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques  
Forensics Auditing

**UNIT - V**

**Cyber Security: Organizational Implications:** Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**TEXT BOOK:**

1. **Cyber Security:** *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. **Introduction to Cyber Security**, Chwan-Hwa(john) Wu, J. David Irwin. CRC Press T&F Group

**REFERENCE BOOK:**

1. **Cyber Security Essentials**, James Graham, Richard Howard and Ryan Otson, CRC Press.

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**INFORMATION SYSTEMS CONTROL AND AUDIT (PE - IV)**

**Course Objectives:**

- To learn about the information system control
- To learn about the information system auditing
- To learn about the management control, application control framework.
- To learn about collection of evidence, evaluation of evidence

**UNIT- I**

Overview of Information System Auditing, Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

The management Control Framework-I: Introduction, Evaluating the planning Function, Evaluating the Leading Function, Evaluating the Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

**UNIT- II**

The Management Control Framework-II: Security Management Controls, Operations management Controls Quality assurance Management Controls.

The Application Control Framework-I: Boundary Controls, Input Controls, Communication Controls.

**UNIT-III**

The Application Control Framework-II: Processing Controls, Database Controls, output Controls.

**UNIT- IV**

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools.

**UNIT -V**

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency.

**REFERENCES:**

1. Ron Weber, Information Systems Control and Audit, Pearson Education, 2002.
2. M.Revathy Sriram, Systems Audit, TMH, New Delhi, 2001.
3. Jalote : Software Project Mangement in Practice, Pearson Education
4. Royce : Software Project Management, Pearson Education.

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**NETWORK PROGRAMMING LAB**

**Course Objectives:**

- To gain hands-on experiences in installing and administering computer systems and networks, in particular, the UNIX version.
- To implement networking and Internet protocols via programming and TCP/IP protocol architecture; user datagram protocol.
- TO implement shell script that accepts a list of files.

**LIST OF SAMPLE PROBLEMS/EXPERIMENTS:**

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
6. Write a shell script that accepts any number of arguments and prints them in the reverse order.
7. Write a shell script that determines the period for which a specified user is working on the system.
8. Write a shell script to list all of the directory files in a directory.
9. Write an interactive file-handling shell program- Let it offer the user the choice of copying, removing or linking files. Once the user has made a choice, have the program ask him for the necessary information such as the file name, new name and so on.
10. Write a shell script to find factorial of a given integer.
11. Write a shell script to find the G.C.D. of two integers.
12. Write a shell script to generate a multiplication table.
13. Write a shell script that copies multiple files to a directory.
14. Write a shell script that counts the number of lines and words present in a given file. \*15. Write a shell script that displays the list of all files in the given directory.
15. Write a shell script (small calculator) that adds, subtracts, multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns reminder. The script requires 3 arguments: The operation to be used and two integer numbers. The options are add (-a), subtract (-s), multiply (-m), quotient (-c) and reminder (-r).
16. Write a shell script to reverse the rows and columns of a matrix.
17. Write a sed command that deletes the first character in each line in a file.
18. Write sed command that deletes the character before the last character in each line a file.
19. Write a sed command that swaps the first and second words in each line of a file.
20. Write an awk script that reads a file of which each line has 5 fields – ID, NAME, MARKS1, MARKS2, MARKS3 and finds out the average for each student. Print out the average marks with appropriate messages.

21. Write an awk script to find the factorial of a user supplied number.
22. `ls -l` command produces long listing of files.
23. Write an awk script 1) to print the selected fields (Ex: size and name of the files) from the file listing. 2) to print the size of all files and number of files.
24. Write an awk script to count the number of lines in a file that do not contain vowels.
  25. Write an awk script to find the number of characters, words and lines in a file.
  26. Write a c program that makes a copy of a file using
    - a. Standard I/O
    - b. System calls.
  27. Write a C program that counts the number of blanks in a text file
    - a. Using standard I/O
    - b. Using system calls
  28. Implement in C the following UNIX commands using system calls
    - a. `cat`
    - b. `ls`
    - c. `mv`
  29. Write a program that takes one or more file/directory names as command line input and reports the following information on the file.
    - a. File type.
    - b. Number of links.
    - c. Time of last access.
    - d. Read, Write and Execute permissions.
  30. Write a c program to emulate the UNIX `ls -l` command.
  31. Write a c program that creates a directory, puts a file into it, and then removes it.
  32. Write a c program that searches for a file in a directory and reports whether the file is present in the directory or not.
33. Write a c program to list for every file in a directory, its inode number and file name.
34. Write a c program that creates a file containing hole which is occupying some space but having nothing.
35. Write a c program that demonstrates redirection of standard output to a file.  
Ex: `ls > f1`.
36. Write a c program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
37. Write a c program to create a Zombie process.
38. Write a c program that illustrates how an orphan is created.
39. Write a c program that creates a child process to execute a command. The command to be executed is passed on the command line.
40. Write a c program that accepts two small numbers as arguments and then sums the two numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum.
41. Write a c program that illustrates how to execute two commands concurrently with a command pipe. Ex:- `ls -l | sort`
42. Write c programs that illustrate communication between two unrelated processes using named pipe.
43. Write a c program in which a parent writes a message to a pipe and the child reads the message.
44. Write a c program that illustrates suspending and resuming processes using signals.
45. Write a c program that displays the real time of a day every 60 seconds, 10 times.
46. Write a c program that runs a command that is input by the user and prints the exit status if the command completes in 5 seconds. If it doesn't, then the parent uses `kill` to send a `SIGTERM` signal to kill the child process.
47. Write a C program that illustrates file-locking using semaphores.
48. Write a C program that implements a producer-consumer system with two processes. (Using semaphores).
49. Write client and server programs (using C) for
  - a. Interaction between server and client processes using Unix Domain Sockets.

- b. Interaction between server and client processes using Internet Domain Sockets.
- 50. Write a C program (sender.c )
  - a. To create a message queue with read and write permissions.
  - b. To write 3 messages to it with different priority numbers.
- 51. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in 63.a) and displays them.
- 52. Write C program that illustrates two processes communicating via shared memory.
- 53. Design TCP iterative Client and server application to reverse the given input sentence
- 54. Design TCP iterative Client and server application to reverse the given input sentence
- 55. Design TCP client and server application to transfer file
- 56. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
- 57. Design a TCP concurrent server to echo given set of sentences using poll functions
- 58. Design UDP Client and server application to reverse the given input sentence
- 59. Design UDP Client server to transfer a file
- 60. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
- 61. Design a RPC application to add and subtract a given pair of integers

**TEXT BOOKS:**

- 1. Advance Unix Programming Richard Stevens, Second Edition Pearson Education
- 2. Advance UNIX Programming, N.B. Venkateswarlu, BS Publication.
- 3. UNIX and Shell programming, B.A.Forouzan and R.F.Gilberg, Thomson.
- 4. UNIX and Shell Programming, M.G. Venkatesh Murthy, Pearson Education.
- 5. UNIX Shells by Example, 4th Edition, Ellie Quigley, Pearson Education.