JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech CSE for COMPUTER NETWORKS & INFORMATION SECURITY Programme

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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KAKINADA – 533 003, Andhra Pradesh, India

I - SEMESTER

S. No	Course Code	Courses	Category	L	T	P	C
1	MTCNIS1101	**Program Core-1** Transport Control Protocol/Internet Protocol (TCP/IP)	PC	3	0	0	3
2	MTCNIS1102	**Program Core-2** Advanced Data Structures	PC	3	0	0	3
3	MTCNIS1103	**Program Elective-1** 1. Advanced Computer Networks 2. Distributed Systems 3. Intrusion Detection & Prevention Systems	PE	3	0	0	3
4	MTCNIS1104	**Program Elective-2** 1. Data Storage Technologies and Networks 2. Wireless Sensor Networks 3. Network Programming	PE	3	0	0	3
5	MTCNIS1105	**Research Methodology and IPR**	CC	2	0	0	2
6	MTCNIS1106	**Laboratory-1** Transport Control Protocol/Internet Protocol (TCP/IP) Lab	LB	0	0	4	2
7	MTCNIS1107	**Laboartory-2** Advanced Data Structures Lab	LB	0	0	4	2
8	MTCNIS1108	**Audit Course-1***	AC	2	0	0	0
Total Credits							18

II -SEMESTER

S. No	Course Code	Courses	Category	L	T	P	C
1	MTCNIS1201	**Program Core-3** Principles of Cyber Security	PC	3	0	0	3
2	MTCNIS1202	**Program Core-4** Cyber Crime Investigation & Digital Forensics	PC	3	0	0	3
3	MTCNIS1203	**Program Elective-3** 1. Wireless and Mobile Security 2. Android Security Design and Internals 3. Firewall and VPN Security 4. Information Theory & Coding	PE	3	0	0	3
4	MTCNIS1204	**Program Elective-4** 1. Vulnerability Assessment & Penetration Testing 2. Cloud & IoT Security 3. Applied Cryptography 4. Secure Coding	PE	3	0	0	3
5	MTCNIS1205	**Laboratory-3** Cyber Security Lab	LB	0	0	4	2
6	MTCNIS1206	**Laboartory-4** Cyber Crime Investigation & Digital Forensics Lab	LB	0	0	4	2
7	MTCNIS1207	**Mini Project with Seminar**	MP	0	0	0	2
8	MTCNIS1208	**Audit Course-2***	AC	2	0	0	0
Total Credits							18

*Student has to choose any one audit course listed below.

Audit Course 1 & 2:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

III -SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	MTCNIS2101	**Program Elective-5** 1. Cloud Architectures and Security 2. Information Security Management and Standards 3. Cyber Laws and Security Policies 4. MOOCs-1 (NPTEL/SWAYAM)-12 Week Program related to the programme which is not listed in the course structure		3	0	0	3
2	MTCNIS2102	**Open Elective** 1. MOOCs-2 (NPTEL/SWAYAM)-Any 12 Week Course on Engineering /Management/ Mathematics offered by other than parent department 2. Course offered by other departments in the college		3	0	0	3
3	MTCNIS2103	**Dissertation-I/Industrial Project#**		0	0	20	10
		Total Credits					16

#Students going for Industrial Project/Thesis will complete these courses through MOOCs

Iv -SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	MTCNIS2201	**Dissertation-II**		0	0	32	16
Total Credits							16

Open Electives offered by the Department of CSE for other Departments Students

1. Python Programming
2. Principles of Cyber Security
3. Internet of Things
4. Artificial Intelligence and Machine Learning

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I Year - I Semester		L	T	P	C
		3	0	0	3
Transport Control Protocol/Internet Protocol (MTCNIS1101)					

Course Objectives:

- Able to learn about the protocols which are using in the current scenario.
- To learn and understand client server relations and OSI programming Implementation of the socket and IPC.

Course Outcomes:

- Explain OSI Model and Standard Internet Services and Protocols
- How to handle server process termination
- Acquire the knowledge of Elementary TCP sockets and I/O Multiplexing and socket options
- Demonstrate the concepts of FIFOs streams messages and Remote logins.

UNIT-I: Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

UNIT-II: TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

UNIT-III: Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function. **I/O Multiplexing and socket options:** I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, get-sockopt and set-sockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

UNIT-IV: Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP. **Elementary name and Address conversions:** DNS, get-host by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

UNIT-V: IPC- Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores. **Remote Login:** Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

Text Books:

1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

Reference Books:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

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I Year - I Semester		L	T	P	C
		3	0	0	3

Advanced Data Structures (MTCNIS1102)

Course Objective:

- The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem
- Students should be able to understand the necessary mathematical abstraction to solve problems
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems
- Student should be able to come up with analysis of efficiency and proofs of correctness

Course Outcomes:

- Discuss the concepts of Collision Resolution Techniques in Hashing and implement symbol table using hashing techniques
- Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
- Develop algorithms for text processing applications.
- Identify suitable data structures and develop algorithms for computational geometry problems.

UNIT-I: Dictionaries-Definition, Dictionary Abstract Data Type, and Implementation of Dictionaries. Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT-II: Skip Lists- Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

UNIT-III: Trees-Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

UNIT-IV: Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem

UNIT-V: Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad-trees, k-D Trees. Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

Text Books:

1. Data Structures: A Pseudo-code Approach, 2/e, Richard F.Gilberg, Behrouz A.Forouzon, Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press

Reference Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

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I Year - I Semester		L	T	P	C
		3	0	0	3
Advanced Computer Networks MTCNIS11XX					

Course Objectives:

- To become familiar with the basics of Computer Networks.
- To learn Network architectures.
- To learn Concepts of fundamental protocols.
- To gain the knowledge of internetworking concepts.
- To understand the knowledge of internetworking concepts in various applications.
- To acquire knowledge of implementation concepts in congestion control and error detections.

Course Outcomes: At the end of the course, student will be able to

- Classify network services, protocols and architectures, explain why they are layered.
- Knowledge on key Internet applications and their protocols, and ability to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Practical knowledge gained by hands-on sessions.
- Gain the knowledge of application layer protocol.
- List the role and responsibilities of a system administrator and Create and administer user accounts on both a Linux and Windows platform.

UNIT–I: Foundation- Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

UNIT–II: Internetworking- I- Switching and Bridging, Data-grams, Virtual Circuit Switching, Source Routing, Bridges and LAN, Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub-netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.

UNIT–III: Internetworking- II- Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP.

UNIT–IV: End-to-End Protocols- Simple De-multiplexer (UDP), Reliable Byte Stream (TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

UNIT–V: Congestion Control and Resource Allocation- Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance.TheDomainNameSystem(DNS),ElectronicMail(SMTP,POP,IMAP,MIME),WorldWide Web(HTTP),Network Management(SNMP) .

Text Books:

1. Larry Peterson and Bruce S Davis "Computer Networks: A System Approach" 5th Edition , Elsevier-2014
2. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014

Reference Books:

1. Uyless Black "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI
2. Behrouz A Forouzan "TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill.

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I Year - I Semester		L	T	P	C
		3	0	0	3
Distributed Systems MTCNIS11XX					

Course Objectives:

- Students will get exposure to various Distributed Systems and their architectures
- Students will get exposed to Remote Invocation and Distributed file systems.
- Students will learn the different communication mechanisms and its advantages and disadvantages.
- Students will get exposure on transaction management and Replication.

Course Outcomes:

- Explain resource sharing in distributed systems and different system models used to construct Distributed system network between systems
- Illustrate Distributed Objects and Remote Invocation
- Explore functional distributed file systems
- Explain Distributed Transaction management, Coordination and Agreement between distributed processes
- Design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc)

UNIT I: Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. (6 hours) System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT II: Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT III: Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.

UNIT IV: Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multi-cast Communication.

UNIT V: Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, Pearson Publication
2. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge

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		3	0	0	3

Intrusion Detection & Prevention Systems (MTCNIS11XX)

Course Objectives:

- Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
- 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
- Analyze intrusion detection alerts and logs to distinguish attack types from false alarms

Course Outcomes:

- Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets.
- Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems.

UNIT-I: History of Intrusion detection, Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

UNIT-II: Intrusion Prevention Systems, Network IDs protocol based Ids, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis.

UNIT-III: Introduction to Snort; Snort Installation Scenarios, Installing Snort, Running Snort on Multiple, Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

UNIT-IV: Working with Snort Rules, Rule Headers, Rule Options, and the Snort Configuration File etc. Plug-in, Pre-processors and Output Modules, Using Snort with My-SQL.

UNIT-V: Using ACID and Snort Scarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.

Text Books:

1. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

Reference Books:

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

I Year - I Semester		L	T	P	C
		3	0	0	3
Data Storage Technologies and Networks MTCNIS11XX					

Course Outcomes:

- To provide learners with a basic understanding of Enterprise Data Storage and Management Technologies
- Study storage technologies: SAN, NAS, IP storage etc., which will bridge the gap between the emerging trends in industry and academics.

Course Outcomes:

- Explain the Optical, Semiconductor media and techniques for read/write operations
- Overview of Virtualization Technologies, Storage Area Network
- Discuss the Networked Attached Storage and Networking issues.
- Classify the applications as per their requirements and select relevant SAN solutions.

UNIT-1: Storage Media and Technologies – Magnetic, Optical and Semiconductor Media, Techniques for read/write Operations, Issues and Limitations.

UNIT-II: Usage and Access – Positioning in the Memory Hierarchy, Hardware and Software Design for Access, Performance issues.

UNIT-III: Large Storages – Hard Disks, Networked Attached Storage, Scalability issues, Networking issues.

UNIT-IV: Storage Architecture - Storage Partitioning, Storage System Design, Caching, Legacy Systems.

UNIT-V: Storage Area Networks – Hardware and Software Components, Storage Clusters/Grids.
Storage QoS– Performance, Reliability and Security issues.

Text Books:

1. The Complete Guide to Data Storage Technologies for Network-centric Computing Paperback– Import, Mar 1998 by Computer Technology Research Corporation
2. Data Storage Networking: Real World Skills for the CompTIA Storage by Nigel Poulton

I Year - I Semester		L	T	P	C
		3	0	0	3
Wireless Sensor Networks (MTCNIS11XX)					

Course Objectives:

- Understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- Knowledge of outline of the techniques for developing a secure application.
- Recognize opportunities to apply secure coding principles.

Course Outcomes: At the end of the course, student will be able to

- Explain common wireless sensor node architectures.
- Demonstrate knowledge of MAC protocols developed for WSN.
- Demonstrate knowledge of routing protocols developed for WSN.
- Explain mobile data-centric networking principles.
- Describe the WSN standards.

UNIT-I: Characteristics Of WSN: Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

UNIT-II: Medium Access Control Protocols: Fundamentals of MAC protocols, Low duty cycle protocols and wakeup concepts, Contention based protocols, Schedule-based protocols - SMAC – BMAC, Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

UNIT-III: Routing And Data Gathering Protocols Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

UNIT-IV: Embedded Operating Systems: Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

UNIT-V: Applications Of WSN: WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring – Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

Text Books :

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.
2. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.

Reference Books:

1. K. Akkaya and M. Younis, "A survey of routing protocols in wireless sensor networks", Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349
2. Philip Levis, " TinyOS Programming" 3.Anna Ha´c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,

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I Year - I Semester		L	T	P	C
		3	0	0	3
Network Programming (MTCNIS11XX)					

Course Objectives:

- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes:

- Explain the client-server paradigm and socket structures.
- Describe the basic concepts of TCP sockets and TCP echo client-server programs.
- Discuss the UDP sockets and UDP echo client-server programs.
- Explain Socket options and ability to understand IPC.
- Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.

UNIT-I: Introduction to Network Programming: OSI model-transport layer protocols: TCP, UDP and SCTP-network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments-Byte ordering functions-Byte manipulation functions-Address conversion functions

UNIT-II: TCP: introduction to TCP-TCP connection establishment and termination-TIME_WAIT State. Elementary TCP sockets – Socket-connect-bind-listen-accept-fork-exec function-concurrent servers-Close function-read and write functions

UNIT-III: TCP echo client server program-getsockname and getpeername functions I/O multiplexing: I/O models-Select function-TCP echo server using select function-shutdown function-Poll function

UNIT-IV: UDP: Introduction to UDP-difference between TCP and UDP-recvfrom( ) and sendto( ) functions-UDP echo client server program-UDP echo client server using select function. **Socket Options:** IPv4 socket options-IPv6 socket options

UNIT-V: Socket Options: Generic socket options-TCP socket options. IPC: Introduction to IPC-forms of IPC-UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP-ping-arp-SMTP-TELNET

Text Books:

1. Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.

References Books:

1. Advanced programming in the UNIX environment, W.Richard Stevens ,pearson education

I Year - I Semester		L	T	P	C
		2	0	0	2
RESEARCH METHODOLOGY AND IPR					

UNIT 1:

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 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics, 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 3:

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 4:

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

UNIT 5:

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

REFERENCES:

(1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
(2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
(3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
(4) Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
(5) Mayall, "Industrial Design", McGraw Hill, 1992.
(6) Niebel, "Product Design", McGraw Hill, 1974.
(7) Asimov, "Introduction to Design", Prentice Hall, 1962.
(8) (8) Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
(9) T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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I Year - I Semester		L	T	P	C
		0	0	4	2
Transport Control Protocol/Internet Protocol (TCP/IP) Lab (MTCNIS1106)					

Course Objectives: From the course the student will learn

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms and know the concept of data transfer between nodes.
- Able to analyse a communication system by separating out the different functions provided by the network, and understand that there are fundamental limits to any communications system;
- Understand the general principles behind multiplexing, addressing, routing, reliable transmission and other stateful protocols as well as specific examples of each& understand what FEC is and how CRCs work;
- Able to compare communications systems in how they solve similar problems;
- View of both the internal workings of the Internet and of a number of common Internet applications and protocols.

Course Outcomes:

- Demonstrate data link layer functionalities.
- Develop the client server application using socket programming.
- Choose routing protocols to solve real world problems.
- Evaluate FTP, DNS/ HTTP of application layer functionalities.

Experiment 1
Implementation of Stop & Wait Protocol and Sliding Window Protocol.

Experiment 2
Study of Socket Programming and Client Server model.

Experiment 3
Write a code simulating ARP /RARP protocols.

Experiment 4
Write a code simulating PING and TRACEROUTE commands.

Experiment 5
Create a socket for HTTP for web page upload and download.

Experiment 6
Write a program to implement RPC (Remote Procedure Call).

Experiment 7

Implementation of Sub-netting .

Experiment 8
Applications using TCP Sockets like
a. Echo client and echo server b. Chat c. File Transfer

Experiment 9
Applications using TCP and UDP Sockets like
a.DNS b. SNMP c. File Transfer

Experiment 10
Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS.

Experiment 11
Configure a DNS server.

Experiment 12
Implement the client for Simple Mail Transfer Protocol (SMTP).

Experiment 13
Configure a mail server for IMAP/POP protocols and write a simple SMTP client to send and receive mails.

Experiment 14
Configuring a Cisco Router as a DHCP Server.

I Year - I Semester		L	T	P	C
		0	0	4	2

Advanced Data Structures Lab

Course Objectives:

From the course the student will learn

- Knowing about oops concepts for a specific problem.
- Various advanced data structures concepts like arrays, stacks, queues, linked lists, graphs and trees.

Course Outcomes:

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Examine algorithms performance using Prior analysis and asymptotic notations.
- Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
- Apply and analyze functions of Dictionary

Experiment 1:
Implement Multi stacks.

Experiment 2:
Implement Double Ended Queue (De-queues) & Circular Queues.

Experiment 3:
Implement various Recursive operations on Binary Search Tree.

Experiment 4:
Implement various Non-Recursive operations on Binary Search Tree.

Experiment 5:
Implement BFS for a Graph

Experiment 6:
Implement DFS for a Graph.

Experiment 7:
Implement Merge & Heap Sort of given elements.

Experiment 8:
Implement Quick Sort of given elements.

Experiment 9:
Implement various operations on AVL trees.

Experiment 10:
Implement B: Tree operations.

Experiment 11:
Implementation of Binary trees and Traversals (DFT, BFT)

Experiment 12:
Implement Kruskal's algorithm to generate a min-cost spanning tree.

Experiment 13:
Implement Prim's algorithm to generate a min-cost spanning tree.

Experiment 14:
Implement functions of Dictionary using Hashing.

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I Year - II Semester		L	T	P	C
		3	0	0	3

Principles of Cyber Security

Course Objectives:

- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

Course Outcomes: At the end of the course, student will be able to

- Apply cyber security architecture principles.
- Describe risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I: Introduction to Cyber security- Cyber security objectives, Cyber security roles, Differences between Information Security & Cyber security.
Cyber security Principles-Confidentiality, integrity, &availability Authentication & non- repudiation.

UNIT–II: Information Security (IS) within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts.
Risks & Vulnerabilities-Basics of risk management, Operational threat environments, Classes of attacks.

UNIT–III: Incident Response- Incident categories, Incident response Incident recovery.
Operational security protection: Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.

UNIT–IV: Threat Detection and Evaluation (DE): Monitoring- Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances.
Analysis- Network traffic Analysis, packet capture and analysis

UNIT–V: Introduction to backdoor System and security-Introduction to metasploit, Backdoor, demilitarized zone(DMZ),Digital Signature, Brief study on Harding of operating system.

Text Books:

1. NASSCOM: Security Analyst Student Hand Book Dec 2015.
2. Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton ,Published by BCS, June 2013.

Reference Books:

1. CSX- cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security.

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I Year - II Semester		L	T	P	C
		3	0	0	3
Cyber Crime Investigation and Digital Forensics					

Course Objectives:

- Able to identify security risks and take preventive steps
- To understand the forensics fundamentals.
- To understand the evidence capturing process.
- To understand the preservation of digital evidence

Course Outcomes: At the end of the course, student will be able to

- Acquire the definition of computer forensics fundamentals.
- Describe the types of computer forensics technology
- Analyze various computer forensics systems.
- Illustrate the methods for data recovery, evidence collection and data seizure.
- Summarize duplication and preservation of digital evidence.

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

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

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

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

UNIT– V: Laws And Acts: Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

Text Books:

1. Cyber Security (with CD): Understanding Cyber Crimes, Computer Forensics and Legal Perspectives (Wind), by Nina Godbole, Sunit Belapure, wiley

Reference Books:

1. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning,New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics", TataMcGraw-Hill, New Delhi, 2006.
3. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005

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I Year - II Semester		L	T	P	C
		3	0	0	3

Wireless and Mobile Security

Course Objective:

- Student able to learn issues and technologies involved in designing a wireless and mobile system that is robust against various attacks
- To learn and understand Application Level Security in Wireless Networks
- Understand and apply the knowledge in real time applications

Course Outcomes: After the completion of the course, student will be able to

- Familiarize with the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
- Gain knowledge and understanding of the various ways in which wireless networks can be attacked and tradeoffs in protecting networks.
- Have a broad knowledge of the state-of-the-art and open problems in wireless and mobile security, thus enhancing their potential to do research or pursue a career in this rapidly developing area.
- Learn various security issues involved in cloud computing.
- Learn various security issues related to GPRS and 3G.

UNIT- I : Security Issues in Mobile Communication: Mobile Communication History, Security – Wired Vs Wireless, Security Issues in Wireless and Mobile Communications, Security Requirements in Wireless and Mobile Communications, Security for Mobile Applications, Advantages and Disadvantages of Application – level Security.

UNIT-II: Security of Device, Network, and Server Levels: Mobile Devices Security Requirements, Mobile Wireless network level Security, Server Level Security.
Application Level Security in Wireless Networks: Application of WLANs, Wireless Threats, Some Vulnerabilities and Attach Methods over WLANs, Security for 1G Wi-Fi Applications, Security for 2G Wi-Fi Applications, Recent Security Schemes for Wi-Fi Applications

UNIT -III : Application Level Security in Cellular Networks: Generations of Cellular Networks, Security Issues and attacks in cellular networks, GSM Security for applications, GPRS Security for applications, UMTS security for applications, 3G security for applications, Some of Security and authentication Solutions.

UNIT-IV: Application Level Security in MANETs: MANETs, Some applications of MANETs, MANET Features, Security Challenges in MANETs, Security Attacks on 3MANETs, External Threats for MANET applications, Internal threats for MANET Applications, Some of the Security Solutions. Ubiquitous Computing, Need for Novel Security Schemes for UC, Security Challenges for UC, and Security Attacks on UC networks, some of the security solutions for UC.

UNIT -V : Data Center Operations - Security challenge, implement "Five Principal Characteristics of Cloud Computing, Data center Security Recommendations Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards.

Text Books:

1. PallapaVenkataram, SatishBabu: "Wireless and Mobile Network Security", 1st Edition, Tata McGraw Hill,2010.
2. Frank Adelstein, K.S.Gupta: "Fundamentals of Mobile and Pervasive Computing", 1st Edition, Tata McGraw Hill 2005.

References Books:

1. Randall k. Nichols, Panos C. Lekkas: "Wireless Security Models, Threats and Solutions", 1st Edition, Tata McGraw Hill, 2006.
2. Bruce Potter and Bob Fleck: "802.11 Security", 1st Edition, SPD O"REILLY 2005.
3. James Kempf: "Guide to Wireless Network Security, Springer. Wireless Internet Security – Architecture and Protocols", 1st Edition, Cambridge University Press, 2008.

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I Year - II Semester		L	T	P	C
		3	0	0	3
Android Security Design and Internals					

Course Objectives:

- To study about the basic architecture of Android and its features
- To learn the various natures of permission in Android Platform
- To implement a simple Android APK following Secure coding principles
- To understand and implement the various services provided through Android platform
- To build and secure custom Android ROM.

Course Outcomes:

- Explain the Android Security model
- Describe the various natures of permission in Android Platform
- Build a Secure Smartphone Society
- Explain the secure custom Android ROM

UNIT-I: Android Security Model- Linux Kernel- Native User space – Dalvik VM- Java Run Time Libraries- System Services- IPC- Binder's- Framework Libraries- Applications- Sandboxing- Code Signing and Platform Key- SELinux- System Updates- Verified Boot.

UNIT-II: Permissions-Nature of Permission- Request for permission- Management- Protecting Levels- Assignment- Enforcement- System Permission- Shared User ID- Custom Permission– Broadcast Permissions- Content Provider Permission- Pending Intents.

UNIT- III: Introduction to Secure Coding-Building a Secure Smartphone Society - Developer's Context- Steps to Install Sample Codes into Android Studio- Android Application Security- Handling Input Data Carefully and Securely.

UNIT-IV: Application Development : Creating/Using Activities- Receiving/Sending Broadcasts.- Creating/Using Content Providers- Creating/Using Services- Using SQLite- Handling Files- Using Browsable Intent- Outputting Log to Log Cat- Using Web View- Using Notifications.

UNIT-V – Secure Functions: Building custom Android ROM- Steps and Tools, Creating Password Input Screens-Permission and Protection Level- Add In-house Accounts to Account Manager- Communicating via HTTPS- Handling privacy data- Using Cryptography- Using fingerprint authentication features- Risk of Information Leakage from Clipboard.

Text Books:

1. Nikolay Elenkov, "Android Security Internals: An In-Depth Guide to Android's Security ", ISBN-13: 978-1-59327-581-5, reprint, No Starch Press,2014.
2. Japan Smartphone Security Association, "Android Application Secure Design/Secure Coding Guidebook", JSSEC-TECA-SC-GD20170201BE, Secure Coding Working Group, February 1, 2017 Edition.

Reference Books:

1. "Application Security for the Android Platform", Jeff Six ,O'Reilly Media, Inc., 2011.

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I Year - II Semester		L	T	P	C
		3	0	0	3

Firewall and VPN Security

Course Objectives:

- Identify and assess current and anticipated security risks and vulnerabilities
- Develop a network security plan and policies
- Establish a VPN to allow IPSec remote access traffic
- Monitor, evaluate and test security conditions and environment
- Develop critical situation contingency plans and disaster recovery plan
- Implement/test contingency and backup plans and coordinate with stakeholders
- Monitor, report and resolve security problems

Course Outcomes: At the end of the course, student will be able to

- To show the fundamental knowledge of Firewalls and it types
- Construct a VPN to allow Remote Access, Hashing, connections with Cryptography and VPN Authorization
- Elaborate the knowledge of depths of Firewalls, Interpreting firewall logs, alerts, Intrusion and Detection
- Infer the design of Control Systems of SCAD, DCS, PLC's and ICS's

UNIT – I: Firewall Fundamentals: Introduction, Types of Firewalls, Ingress and Egress Filtering, Types of Filtering, Network Address Translation (NAT), Application Proxy, Circuit Proxy, Content Filtering, Software versus Hardware Firewalls, IPv4 versus IPv6 Firewalls, Dual-Homed and Triple-Homed Firewalls, Placement of Firewalls.

UNIT –II: VPN Fundamentals: VPN Deployment Models and Architecture, Edge Router, Corporate Firewall, VPN Appliance, Remote Access, Site-to-Site, Host-to-Host, Extranet Access, Tunnel versus Transport Mode, The Relationship Between Encryption and VPNs, Symmetric Cryptography, Asymmetric Cryptography, Hashing, Establishing VPN Connections with Cryptography, Digital Certificates, VPN Authorization.

UNIT–III: Exploring the Depths of Firewalls: Firewall Rules, Authentication and Authorization, Monitoring and Logging, Understanding and Interpreting Firewall Logs and Alerts, Intrusion Detection, Limitations of Firewalls, Downside of Encryption with Firewalls, Firewall Enhancements, Management Interfaces.

UNIT –IV: Overview of Industrial Control Systems: Overview of SCADA, DCS, and PLCs, ICS Operation, Key ICS Components, Control Components, Network Components, SCADA Systems, Distributed Control Systems, Programmable Logic Controllers, Industrial Sectors and Their Interdependencies.

UNIT – V: SCADA Protocols: Modbus RTU, Modbus TCP/IP, DNP3, DNP3 TCP/IP, OPC, DA/HAD, SCADA protocol fuzzing, Finding Vulnerabilities in HMI: software- Buffer Overflows, Shell code. Previous attacks Analysis- Stuxnet, Duqu.

Text Books:

1. Michael Stewart "Network Security, Firewalls, and VPNs" Jones & Bartlett Learning September 2010.
2. T. Macaulay and B. L. Singer, Cyber security for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS, Auerbach Publications, 2011.
3. J. Lopez, R. Setola, and S. Wolthusen, Critical Infrastructure Protection Information Infrastructure Models, Analysis, and Defense, Springer-Verlag Berlin Heidelberg, 2012.

Reference Books:

1. J. Lopez, R. Setola, and S. Wolthusen, Critical Infrastructure Protection Information Infrastructure Models, Analysis, and Defense, Springer-Verlag Berlin Heidelberg, 2012.
2. Robert Radvanovsky and Jacob Brodsky, editors. Handbook of SCADA/Control Systems Security. CRC Press, 2013.
3. A.W. Colombo, T. Bangemann, S. Karnouskos, S. Delsing, P. Stluka, R. Harrison, et al. Industrial cloud-based cyber-physical systems Springer International Publishing, 2014.
4. D. Bailey, Practical SCADA for Industry. Burlington, MA: Newnes, 2003.

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I Year - II Semester		L	T	P	C
		3	0	0	3
Information Theory & Coding					

Course Objectives:

- The objective of this course is to provide an insight to information coding techniques, error correction mechanism.
- To learn various compression techniques for text, video and image are covered for thorough knowledge of efficient information conveying systems.

Course Outcomes:

- Explain the basic concepts of principles and applications of information theory.
- How information is measured in terms of probability and entropy.
- Describe the coding schemes, including error correcting codes, The Fourier perspective and extensions to wavelets, complexity, compression
- Explain the concepts of efficient coding of audio-visual information.

UNIT-I: Information and entropy information measures, Shannon's concept of Information. Channel coding, channel mutual information capacity (BW)

UNIT-II: Theorem for discrete memory less channel, information capacity theorem, Error detecting and error correcting codes

UNIT-III: Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques,

UNIT-IV: Compression: loss less and loss, Huffman codes, LZW algorithm, Binary Image compression schemes, run length encoding, CCITT group 3 1-DCompression, CCITT group 3 2D compression, CCITT group 4 2DCompression.

UNIT-V: Convolution codes, sequential decoding. Video image Compression: CITT H 261 Video coding algorithm, audio (speech) Compression. Cryptography and cipher, Case study of CCITT group 3 1 Decompression, CCITT group 3 2D compression.

Text Books:

1. Fundamentals in information theory and coding, Monica Borda,Springer.
2. Communication Systems: Analog and digital, Singh and Sapre, TataMcGraw Hill.
3. Multimedia Communications Fred Halsall.

Reference Books:

1. Information Theory, Coding and Cryptography R Bose.
2. Multimedia system Design Prabhat K Andleigh and Kiran Thakrar.

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I Year - II Semester		L	T	P	C
		3	0	0	3
Vulnerability Assessment & Penetration Testing					

Course Objectives:

- To identify security vulnerabilities and weaknesses in the target applications.
- To identify how security controls can be improved to prevent hackers gaining access to operating systems and networked environments.
- To test and exploit systems using various tools.
- To understand the impact of hacking in real time machines.

Course Outcomes:

- Explain Penetration testing phases
- Illustrate information gathering methodologies
- Apply System Hacking Techniques in real time applications
- Describe Bypassing WLAN Authentication

UNIT-I: Introduction: Penetration Testing phases/Testing Process, types and Techniques, Blue/Red Teaming, Strategies of Testing, Non Disclosure Agreement Checklist, Phases of hacking, Open-source/proprietary Pentest Methodologies

UNIT II - Information Gathering and Scanning: Information gathering methodologies- Foot printing, Competitive Intelligence- DNS Enumerations- Social Engineering attacks, Port Scanning-Network Scanning- Vulnerability Scanning- NMAP scanning tool- OS Fingerprinting- Enumeration.

UNIT III - System Hacking: Password cracking techniques- Key loggers- Escalating privileges- Hiding Files, Double Encoding, Steganography technologies and its Countermeasures. Active and passive sniffing- ARP Poisoning, MAC Flooding- SQL Injection - Error- based, Union-based, Time-based, Blind SQL, Out-of-band. Injection Prevention Techniques.

UNIT IV - Advanced System Hacking: Broken Authentication, Sensitive Data Exposure, XML External Entities, Broken Access Code, XSS - Stored, Reflected, DOM Based

UNIT- V: Wireless Pentest: Wi-Fi Authentication Modes, Bypassing WLAN Authentication, Types of Wireless Encryption, WLAN Encryption Flaws, AP Attack, Attacks on the WLAN Infrastructure, DoS-Layer1, Layer2, Layer 3, DDoS Attack, Client Misassociation, Wireless Hacking Methodology, Wireless Traffic Analysis

Text Books:

1. Kali Linux 2: Windows Penetration Testing, By Wolf Halton, Bo Weaver , June 2016 Packt Publishing

Reference Books:

1. Mastering Modern Web Penetration Testing By Prakhar Prasad,October 2016 Packt Publishing.
2. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication

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I Year - II Semester		L	T	P	C
		3	0	0	3
Cloud & IoT Security					

Course Objectives:

- Student learn and understand the advantages, challenges, security issues of cloud computing and interrelationships between cloud computing and big data.
- Student learns different Key components of Amazon Web Services, Cloud Backup and solutions.
- Student able to discuss the main threats and attacks on IoT products and services
- Be able to learn secure a connected IoT product from scratch.

Course Outcomes: At the end of the course, student will be able to

- Define Cloud Computing and memorize the different Cloud services and deployment models
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Explain how IOT can be used in different Industries.
- Discuss how companies can plan for the future of technologies.
- How to apply smart applications in real world.

UNIT–I: Cloud Computing Fundamental-Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud

UNIT–II: Cloud Applications-Development environments for service development; Amazon, Azure, Google App. Security management in the cloud – security management standards- SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud

UNIT–III: The Internet of Things-An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet

UNIT–IV: IOT Design-Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT–V: IOT Security Issues- Secure constrained devices, Authorize and authenticate devices, Manage device updates, secure communication, Ensure data privacy and integrity, secure web, mobile, and cloud applications, Ensure high availability**,** Detect vulnerabilities and incidents, Manage vulnerabilities, Predict and preempt security issues.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Raj kamal, McGraw Hill Higher Education
2. Internet of Things, A. Bahgya and V. Madisetti, Univesity Press, 2015

Reference Books:

1. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach
3. IOT Security Issues by Alasdair Gilchrist, O'Reilly Publishers, 2017.
4. Tim Mather, Subra Kumara swamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance.

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I Year - II Semester		L	T	P	C
		3	0	0	3

Applied Cryptography

Course Objectives:

- Student learns the basic concepts of symmetric cryptography and simple encryption methods.
- An understanding of the RSA cryptosystem, the mathematics used in the system, and the ability to encrypt and decrypt clear text using the system.
- To learn the properties of message authentication codes and the ability to use hash functions to build a message authentication code.

Course Outcomes: At the end of the course, student will be able to

- Demonstrate the basics of Cryptographic protocols
- Explain the concepts of Stream Ciphers and Public Key Encryption
- Demonstrate Number Theory for Symmetric and Asymmetric Ciphers and discuss various Ciphers
- Discuss Hashing Algorithms and Message Authentication Codes
- Discuss Key-Exchange algorithms and Real world Implementations

UNIT – I: Foundations: Protocol Building Blocks, Basic Protocols, Advanced Protocols - Zero-Knowledge Proofs, Zero-Knowledge Proofs of Identity, Blind Signatures, Identity-Based Public-Key Cryptography, Key Length, Key Management, Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Self-Synchronizing Stream Ciphers, Cipher- Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Other Block-Cipher Modes, Choosing a Cipher Mode.

UNIT – II: Information Theory, Complexity Theory, Number Theory, Factoring, Prime Number Generation, Discrete Logarithms in a Finite Field, Data Encryption Standard (DES), IDEA, CAST, Blowfish, RC5, Double Encryption, Triple Encryption.

UNIT – III: Pseudo-Random-Sequence Generators and Stream Ciphers- Linear Congruential Generators, Linear Feedback Shift Registers, Stream Ciphers using LFSRs, RC4, Feedback with Carry Shift Registers, Stream Ciphers Using FCSRs, Nonlinear-Feedback Shift Registers, Other Stream Ciphers, One-Way Hash Functions- MD5, Secure Hash Algorithm (SHA), One Way Hash Functions Using Symmetric Block, Using Public Key Algorithms, Message Authentication Codes.

UNIT – IV:
Public-Key Algorithms, Knapsack Algorithms, RSA, Rabinm ElGamal, Elliptic Curve Cryptosystems, Digital Signature Algorithm (DSA), DSA Variants, Gost Digital Signature Algorithm, Discrete Logarithm Signature Schemes, Ong-Schnorr-Shamir, Schnorr, Converting Identification Schemes to Signature Schemes.

UNIT – V:
Diffie- Hellman, Station-to-Station Protocol, Multiple-Key Public-Key Cryptography, Subliminal Channel, Undeniable Digital Signatures, Designated Confirmer Signatures, Kerberos, Privacy-Enhanced Mail (PEM), Message Security Protocol (MSP), Pretty Good Privacy (PGP), Smart Cards, Public-Key Cryptography Standards (PKCS).

Text Books:

1. Applied Cryptography: Protocols, Algorithms, and Source Code in C, 2nd Edition, Bruce Schneier, John Wiley & Sons Inc, 1996
2. Cryptography and Network Security, 6th Edition, William Stallings, Pearson Education, March 2013

Reference Books:

1. Modern Cryptography Theory and Practicel, Wenbo Mao, Pearson Education, 2004
2. Cryptography and network security, Behrouz A. Forouzan, McGraw-Hill, Inc., 2008

I Year - II Semester		L	T	P	C
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Secure Coding

Course Objectives:

- Understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- Knowledge of outline of the techniques for developing a secure application.
- Recognize opportunities to apply secure coding principles.

Course Outcomes: At the end of the course, student will be able to

- List of secure systems and various security attacks
- Demonstrate the development of process of software leads to secure coding practices
- Apply Secure programs and various risk in the software's
- Classify various errors that lead to vulnerabilities
- Design Real time software and vulnerabilities

UNIT–I: Introduction-Need for secure systems, Proactive security development process, Security principles to live by and threat modeling.

UNIT–II: Secure Coding in C-Character strings- String manipulation errors, String Vulnerabilities and exploits Mitigation strategies for strings, Pointers, Mitigation strategies in pointer based vulnerabilities Buffer Overflow based vulnerabilities

UNIT–III: Secure Coding in C++ and Java-Dynamic memory management, Common errors in dynamic memory management, Memory managers, Double –free vulnerabilities, Integer security, Mitigation strategies

UNIT–IV: Database and Web Specific Input Issues-Quoting the Input, Use of stored procedures, Building SQL statements securely, XSS related attacks and remedies

UNIT–V: Software Security Engineering-Requirements engineering for secure software: Misuse and abuse cases, SQUARE process model Software security practices and knowledge for architecture and design

Text Book:

1. Michael Howard, David LeBlanc, "Writing Secure Code", Microsoft Press, 2nd Edition, 2003.

Reference Books:

1. Robert C. Seacord, "Secure Coding in C and C++", Pearson Education, 2nd edition, 2013.
2. Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, "Software Security Engineering: A guide for Project Managers", Addison-Wesley Professional, 2008.

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I Year - II Semester		L	T	P	C
		0	0	4	2
Cyber Security Lab					

Course Objectives:

- Student to get the knowledge about audit and information security management, which makes the student to get the real world experience.
- To learn and implement Data leakage in a website database

Course Outcomes: At the end of the course, student will be able to

- Analyze and implement Audit security policy in windows environment, create a Demilitarized zone creation in Network environment
- Illustrate the Resource harvesting attack and mitigation, Window Patch management policy, Trojans and mitigation strategies
- Apply the knowledge of metasploit, Access control list creation and content filtering limiting the traffic
- Explain the Data leakage in a website database, Password policy and verification, Patch management using MBSA tool on windows machine
- Build an Audit Policy management, Media handling policy and event log analysis and Installation of Trojan, Network DOS attack and proof of bandwidth utilization

Exercise – 1:
Audit security policy implementation in windows environment.

Exercise – 2:
Create a Demilitarized zone creation in Network environment for information security.

Exercise – 3:
Implement Resource harvesting attack and mitigation.

Exercise – 4:
Implement Window Patch management policy.

Exercise – 5:
Knowing the Behavior of Trojans and mitigation strategies.

Exercise- 6
Create a metasploit and make it to implement.

Exercise-7
Access control list creation and content filtering limiting the traffic.

Exercise-8
Data leakage in a website database and preventive measures.

Exercise-9
Password policy implementations and verification.

Exercise-10
Patch management implementation using MBSA tool on windows machine

Exercise-11

Audit Policy management for users and computers log analysis.

Exercise-12
Media handling policy implementation and event log analysis.

Exercise-13
Installation of Trojan and study of different options.

Exercise-14
Network DOS attack and proof of bandwidth utilization and preventive steps.

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I Year - II Semester		L	T	P	C
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Cyber Crime Investigation and Digital Forensic Lab					

Course Objectives:

- Investigate cybercrime and collect evidences
- Able to use knowledge of forensic tools and software
- To understand the preservation of digital evidence.
- To learn about stenography Perceptual models

Course Outcomes: At the end of the course, student will be able to

- Identify the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
- Construct the file system storage mechanisms of two common desktop opera ting systems and forensics tools used in data analysis.
- List and Implement all running processes, network connections from a memory image and find whether a firewall is set by analyzing a memory image.
- Define and perform live incident response on a system, View all browser history and List out all established network connections in a computer (Hint: Triage Incident Response).

Experiment- 1
Evidence Collection

a) Linux: Capturing RAM dump using fmem
   https://github.com/NateBrune/fmem
   i) dcfldd if=/dev/fmem of=memory.dump hash=sha256
      sha256log=memory.dump.sha256 bs=1MB count=1000
b) Linux: Capturing Disk using dfldd
   https://www.obsidianforensics.com/blog/imaging-using-dcfldd
   i) dcfldd if=/dev/sdb1 of=/media/disk/test_image.dd hash=md5,
      sha1hashlog=/media/disk/hashlog.txt
c) Windows: Capture RAM dump of a windows system
   a. Hint: FTK Imager or RAMCapture

Windows: Capture Disk Image of a windows system(Hint: FTK Imager)

Experiment- 2
Disk Analysis

i) List all files in a directory from a disk image
   a. FTK Imager
ii) Export a particular file from a disk image
   a. FTK Imager
iii) Recover a deleted file from a disk image

FTK Imager

Experiment- 3
Memory Analysis

1. List all running processes from a memory image
2. List all network connections from a memory image
3. Find out whether a firewall is set by analyzing a memory image

Hint: volatility

Experiment- 4

4) Live Incident Response
   1. Perform live incident response on a system
   2. View all browser history in a computer
   3. List out all established network connections in a computer

Hint: Triage Incident Response

Exercise- 5
Implement E-Mail Tracking and Email Investigation

Exercise- 6
Implement video Analytics for a live video

Exercise- 7
Analysis on different Malware Working

Exercise- 8
Work on Mail Bombs &SMS bombs

Exercise- 9
Implement a case on windows and Linux forensics

Exercise- 10
Implement a case on network Forensic

Exercise- 11
Work on different types of vulnerabilities

Exercise- 12
Implement a case on Mobile Forensics

Exercise- 13
Develop an Evidence and Preparation and Documentation

I Year - II Semester		L	T	P	C
		0	0	0	2
Mini Project with Seminar					

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II Year - I Semester		L	T	P	C
		3	0	0	3
Cloud Architectures and Security					

Course Objective

- To learn the concepts of Cloud computing has drawn the attention of many business organization and normal users of computers in the recent past.
- Student able to learn the Security aspects of cloud computing have always been subjected to many criticisms. Hence it becomes important for any security professional to possess an understanding of the cloud architecture and methods to secure the same.

Course Outcomes

- Explain the basic fundamentals of cloud computing.
- Describe the requirements for an application to be deployed in a cloud.
- Apply the knowledge in the methods to secure cloud.
- Discuss the Multi-tenancy Issues and Virtualization System Security Issues
- Explain the security management standards in cloud

UNIT–I: Cloud Computing Fundamentals-Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture.

UNIT– II: Cloud Applications- Technologies and the processes required when deploying web services- Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages- Development environments for service development; Amazon, Azure, Google App.

UNIT– III: Securing the Cloud- Security Concepts - Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud.

UNIT- IV: Virtualization Security- Multi-tenancy Issues: Isolation of users/VMs from each other- How the cloud provider can provide this- Virtualization System Security Issues: e.g. ESX and ESXi Security, ESX file system security- storage considerations, backup and recovery- Virtualization System Vulnerabilities.

UNIT – V: Cloud Security Management - Security management in the cloud – security management standards- SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud.

Text Books:

1. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition ,2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", Tata McGraw-Hill Osborne Media; 1 edition 22, 2009.
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: "An Enterprise Perspective on Risks and Compliance", O'Reilly Media; 1 edition,2009.

Reference Books:

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security", Wiley, 2010.

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II Year - I Semester		L	T	P	C
		3	0	0	3
Information Security Management and Standards (ISMS)					

Course Objectives:

- Students will get exposure to principles of information security management, contingency planning, and information security policy.
- Students will get an understanding of Security and risk management models and practices.
- Students will gain an understanding of Personnel security, and ISO standards related to information security.

Course Outcomes:

- Explain the principles of information security management and planning.
- Explain the importance of contingency planning, Information security policy, training and awareness.
- Apply the knowledge and understanding of various security models.
- Demonstrate the prominence of risk management and risk assessment.
- Write the significance of personal staffing, perimeter security components related to information security.

UNIT-I: Introduction-What is security, what is management, principles of information security management, project management, applying security to project management. Planning for security, the role of planning, precursors to planning, strategic planning, information security governance, planning for information security implementation.

UNIT-II: Contingency planning, components of contingency planning, Information security policy, why policy, Enterprise information security policy, issue specific and system specific policy. Organizing for security, placing information security within an organization, components, security roles and titles, implementing security education, training and awareness programs.

UNIT-III: Security management models: Access control models, Security architecture models, security management models, security management practices, benchmarking, performance measurement in InfoSec management

UNIT-IV: Risk Management, Risk Identification and Risk Assessment, documenting the results of risk assessment, Risk control strategies, managing risk, feasibility and cost benefit analysis, recommended risk control practices.

UNIT-V: Personnel and Security: Staffing the security function, employment policies and practices. Protection mechanism, access control, firewalls, IDS, IPS, remote access protection, wireless networking protection. 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. Management of Information Security 4th edition, Michael. E. Whitman, Herbert J Mattord, 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.

Reference Books:

1. Information Security Management Handbook , 6e, Harold F. Tipton, 2007

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II Year - I Semester		L	T	P	C
		3	0	0	3

Cyber Laws and Security Policies

Course Objectives:

- The Objectives Of This Course Is To Enable Learner To Understand, Explore, And Acquire A Critical Understanding Cyber Law.
- Student learns and develops Competencies for Dealing with Frauds and Deceptions (Confidence Tricks, Scams) And Other Cyber Crimes For Example, Child Pornography Etc. That Are Taking Place Via The Internet.
- Student should learn security policies and procedures.

Course Outcomes: At the end of the course, student will be able to

- Explain the Social And Intellectual Property Issues Emerging From 'Cyberspace.
- Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace
- Develop The Understanding Of Relationship Between Commerce And Cyberspace.
- Determine in Depth Knowledge Of Information Technology Act And Legal Frame Work Of Right To Privacy, Data Security And Data Protection.
- Apply various Case Studies on Real Time Crimes.

UNIT–I: Introduction to Computer Security- Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT–II: Secure System Planning and administration- Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, and Network Security, The Redbook and Government network evaluations.

UNIT–III: Information security policies and procedures-Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies- asset classification policy- developing standards.

UNIT–IV: Information security-fundamentals-Employee responsibilities- information classification-Information handling- Tools of information security- Information processing-secure program administration.

UNIT–V: Organizational and Human Security-Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals, IT Act- Structure of IT Act, Common cyber crime scenarios and Applicability of Legal sections, Case studies as per selected IT Act sections.

Text Books:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback), 2ndEdition, O" Reilly Media, 2006.
2. Thomas R. Peltier, Information Security policies and procedures: A Practitioner's Referencel, 2nd Edition Prentice Hall,2004.
3. Kenneth J. Knapp, Cyber Security and Global Information Assurance: Threat Analysis and Response Solutionsl, IGI Global, 2009.

Web References:

1. https://meity.gov.in/content/information-technology-act-2000

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	L	T	P	C
IV Semester	**0**	**0**	**32**	**16**

(DISSERTATION) DISSERTATION PHASE – I AND PHASE – II

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.

- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

Course Outcomes:

At the end of this course, students will be able to

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a written report.
4. Presenting the work in International/ National conference or reputed journals.

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AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

Understand that how to improve your writing skills and level of readability
Learn about what to write in each section
Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus

Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:

learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus		
Units	**CONTENTS**	**Hours**
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	**Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep

Publication Pvt. Ltd., New Delhi.

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	4
2	Order Introduction of roots Technical information about Sanskrit Literature	4
3	Technical concepts of Engineering-Electrical,	4
4	Technical concepts of Engineering - Mechanical.	4
5	Technical concepts of Engineering - Architecture.	4
6	Technical concepts of Engineering – Mathematics.	4

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements	4
2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism.Love for nature ,Discipline	4
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking.	4
4	Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	4
5	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women.	4
6	All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively	4

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Course outcomes

Students will be able to 1.Knowledge of self-development
2.Learn the importance of Human values 3.Developing the overall personality

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Units	Content	Hours
1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.	4
4	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4
5	**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
6	**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus		
Units	**Content**	**Hours**
1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.	4
2	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.	4
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	4
4	Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.	4
5	Professional development: alignment with classroom practices and follow-up support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes	4
6	**Research gaps and future directions** Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.	4

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content	Hours
1	Definitions of Eight parts of yog. (Ashtanga)	5
2	Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha	5
3	Yam and Niyam. Do`s and Don't's in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	5
4	Asan and Pranayam Various yog poses and their benefits for mind & body	5
5	Regularization of breathing techniques and its effects-Types of pranayam	4

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	4
2	Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)	4
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,	4
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	4
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18	4
6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	4

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

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