JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE AND SYLLBI FOR
M.Tech-Computer Networks
w.e.f. 2017-18 Admitted Batch onwards

M.Tech I Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D58101	Advanced Data Structures and Algorithms	4	-	-	4
2.	17D08101	Network Programming	4	-	-	4
3.	17D08102	Network Security & Cryptography	4	-	-	4
4.	17D58203 17D58108 17D08103 17D08104	Elective-I a. Internet of Things b. Internals of Operating Systems c. Soft Computing d. High Performance Networks	4	-	-	4
5.	17D08105 17D08106 17D25205 17D58106	Elective-II a. Storage Area Networks b. Network Design and Management c. Software Project Management d. Neural Networks	4		-	4
6.	17D58110	Advanced Data Structures and Algorithms Lab	-		4	2
7.	17D08107	Network Programming Lab	-		4	2
8.	17D08108	Network Security Lab			4	2
		Total	20		12	26

M.Tech II Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D58202	Mobile Application Development	4	-	-	4
2.	17D08201	Wireless Sensor Networks	4	-	-	4
3.	17D58201	Big Data Analytics	4	-	-	4
4.	17D08202 17D08203 17D58107 17D25201	Elective-III a. Digital and Cyber Forensics b. Internet Security Protocols c. Artificial Intelligence d. Advances in Software Testing	4	-	-	4
5.	17D08204 17D58206 17D58207 17D25208	Elective-IV a. Mobile Ad hoc Networks b. Machine Learning c. Cloud Computing d. Secure Software Engineering	4		-	4
6.	17D58210	Mobile Application Development Lab	-		4	2
7.	17D08205	Wireless Sensor Networks Lab	-		4	2
8.	17D58209	MapReduce Programming Lab			4	2
		Total	20		12	26

M.Tech III Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective-V (Open Elective) 1. Research Methodology 2. Human Values & Professional Ethics 3. Intellectual Property Rights	4	- -	-	4
2.	17D08301	Elective-VI (MOOCs)	-	-	-	-
3.	17D08302	Comprehensive Viva-Voice	-	-	-	2
4.	17D08303	Seminar	-	-	-	2
5.	17D08304	Teaching Assignment	-	-	-	2
6.	17D08305	Project work Phase-I	-	-	-	4
		Total	**04**	**-**	**-**	**14**

M.Tech IV Semester

S.No.	Subject Code	Subject	L	T	P	C
1.	17D08401	Project work Phase - II	-		-	12
		Total	**-**		**-**	**12**

Project Viva Voce Grades:

A: Satisfactory
B: Not Satisfactory

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(17D58101) ADVANCED DATA STRUCTURES AND ALGORITHMS

UNIT I : Overview of Data Structures - Arrays, Stacks, Queues, linked lists , Linked stacks and Linked queues, Applications

Algorithm Analysis - Efficiency of algorithms, Asymptotic Notations, Time complexity of an algorithm using O notation, Polynomial Vs Exponential Algorithms, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs.

UNIT II: Trees and Graphs – Basics of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs, representation and traversals.

Binary Search Trees, AVL Trees and B Trees - Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

UNIT III: Red – Black Trees, Splay Trees and Hash Tables - Red–Black Trees, Splay Trees and their applications, Hash Tables, Hash Functions and various applications, File Organizations.

UNIT IV: Divide – and – Conquer & Greedy Method - General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Strassen's Matrix Multiplication, Greedy Method- General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

Back Tracking and Branch – and – Bound - General Method, 8 – Queen's Problem, Graph Coloring. Branch – and – Bound: The Method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

UNIT V: Dynamic Programming - General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 /1 Knapsack problem, Reliability Design, Traveling Sales Person's Problem.

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.

References:

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education, 2010.
2. Classic Data Structures by D. Samanta, 2005, PHI
3. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG
6.   Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
7. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.

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(17D08101) NETWORK PROGRAMMING

UNIT I
Introduction: Day Time Client/Server, Concurrent Client/Server, Error Handling, Protocol Independence, Port Numbers.
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 and related function.

UNITII
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
I/O Multiplexing and socket options: I/O Models, Select function, Batch input, shutdown function, Poll function, TCP Echo server, getsockopt and setsockopt 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: Domain Name System, gethostbyname function, RES_USE_INET6 Resolver option, gethostbyname2 function and IPv6 support, gethostbyaddr function, uname function, gethostname function, getservbyname and getservbyport functions.

UNIT V
IPv4 and IPv6 interoperability: IPv4 client,IPv6 server, IPv6 client, IPv4 server .
Network Management and Debugging: Troubleshooting a Network, ping, traceroute, netstat, Packet Sniffers, Network Management Protocols, SNMP.

Text Book:
1. R. W. Stevens, B. Fenner, A. M. Rudoff, *Unix Network Programming: The Sockets Networking API*, 3rd edition, vol.1, PHI, 2010.
2. E. Nemeth, G. Snyder, T. R. Hein, B. Whaley, *UNIX and Linux System Administration Handbook 4th Edition,* Pearson Education 2011.

Reference Books:
1. A.S. Tanenbaum; *Computer Networks*, 5th edition, Pearson, 2012 (Reference Book).
2. B.A. Forouzan, *Data Communications and Networking*, 4th edition, Tata McGraw Hill, 2006 (Reference Book).

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(17D08102) NETWORK SECURITY & CRYPTOGRAPHY

UNIT I

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services And Security Mechanisms, Classical Encryption Techniques- Symmetric Cipher Model, Substitution Ciphers, Transposition Ciphers, Steganography, Modern Block Ciphers, Modern Stream Ciphers.
Modern Block Ciphers: Block Ciphers Principles, Data Encryption Standard (DES), Linear And Differential Cryptanalysis, Block Cipher Modes Of Operations, AES.

UNIT II

Public-Key Cryptography : Principles Of Public-Key Cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Arithmetic, Elliptic Curve Cryptography
Cryptographic Hash Functions: Applications Of Cryptographic Hash Functions, Requirements And Security, Hash Functions Based On Cipher Block Chaining, Secure Hash Algorithm (SHA).

UNIT III

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements For Message Authentication Codes, Security Of Macs, HMAC, Macs Based On Block Ciphers, Authenticated Encryption.
Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols.

UNIT IV

Key Management And Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric, Distribution Of Public Keys, X.509 Certificates, Public Key Infrastructure.
Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME
UNIT V
Security At The Transport Layer(SSL And TLS) : SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security, HTTPS, SSH
Security At The Network Layer (Ipsec): Two Modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

Intruders: Intruders, Intrusion Detection, Password Management, Firewalls, Viruses and Worms.

Text Books :
1. Cryptography and Network Security: Principals and Practice, William Stallings, Fifth Edition, Pearson Education.
2. Cryptography and Network Security, Behrouz A. Frouzan and Debdeep Mukhopadhyay, 2nd edition, Mc Graw Hill Education

Reference Books :
1. Network Security and Cryptography, Bernard Menezes , Cengage Learning.
2. Cryptography and Security, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India.
3. Applied Cryptography, Bruce Schiener, 2nd edition, John Wiley & Sons.
4. Cryptography and Network Security, Atul Kahate, TMH.
5. Introduction to Cryptography, Buchmann, Springer.
6. Number Theory in the Spirit of Ramanujan, Bruce C.Berndt, University Press
7. Introduction to Analytic Number Theory, Tom M.Apostol, University Press

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(17D58203) INTERNET OF THINGS

(Elective-I)

UNIT 1

Introduction - Internet of Things – **Design Principles for Connected Devices** – Web Thinking for Connected Devices – **Internet Principles** – IP – TCP – IP Protocol Suite – UDP – IP Address – MAC Address – TCP and UDP Ports – Application Layer Protocols.

UNIT 2

Prototyping – Prototypes and Production – Cloud – Open Source vs Closed Source – Tapping into the Community **– Prototyping Embedded Devices** – Electronics – Embedded Computing Basics – Ardunio – Raspberry Pi – Beagle Bone Black – Electronic Imp.

UNIT 3

Prototyping thePhysicalDesign – Laser Cutting – 3D Printing – CNC Milling – Repurposing and Recycling – **Prototyping Online Components** – New API – Real Time Reactions – Other Protocols.

UNIT 4

Techniques for writing Embedded Code – Memory Management – Performance and Battery life – Libraries – Debugging – **Business Models** – Models – Funding an Internet of Things Startup.

UNIT 5

Moving to Manufacture – Designing Kits – Designing Printed Circuit Boards – Manufacturing Printed Circuit Boards – Mass Producing the case and other Fixtures – Scaling up Software – **Ethics** – Characterizing the Internet of Things – Control – Environment – Solutions.

Text Books:

1. Adrian Mcewen and HakinCassimally, "Designing The Internet of Things" Wiley Publications , 2015

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media, 2011

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(17D58108) INTERNALS OF OPERATING SYSTEMS

(Elective-I)

UNIT-I   : BUFFER CACHE AND FILE SUB-SYSTEM

Introduction to kernel- Architecture of the UNIX operating system, System Concepts, Data structures.

Buffer Cache: Buffer header, Structure of buffer pool, Reading and writing disk blocks. Files INODES, Structure of a regular file, Directories, Super block, Inode assignment.

UNIT-II   : SYSTEM CALLS AND PROCESS SUB-SYSTEM

System calls- OPEN, READ, CLOSE, WRITE, CREATE, CHMOD, CHOWN, Pipes, Mounting and Unmounting. Process Layout the system memory, context, process control, process creation, signals, process scheduling, time, clock.

UNIT-III   : INTER PROCESS COMMUNICATIONS

Inter-process communications- Process tracing, System V IPC, Shared Memory, Semaphores. Network Communications- Socket Programming: Sockets, descriptors, connections, socket elements, Stream and datagram sockets.

UNIT-IV   : WINDOWS SYSTEM COMPONENTS

Windows Operating System- versions, concepts and tools, Windows internals, System architecture, requirements and design goals, operating system model, architecture overview, key system components. System mechanisms- Trap dispatching, object manager, synchronization, system worker threads, windows global flags, local procedural calls, kernel event tracing.

UNIT-V   : REGISTRY AND PROCESS MANAGEMENT

Windows management mechanisms- the registry, registry usage, registry data types, local structure, trouble shooting registry problems, registry internals, services, applications, accounts, service control manager, windows management instrumentation, processes, threads and jobs: Process internals, flow of create process, thread internals, examining thread creation, thread scheduling, job objects.

TEXT BOOKS:

1. Maurice J. Bach, The design of the UNIX operating system, Prentice hall of India,1991
2. Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, Microsoft Press, 2004.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems: Internals and Design Principles", 5th Edition, Prentice Hall, 2005.

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(17D08103) SOFT COMPUTING

(Elective -I)

Unit - I :

Artificial Intelligence: AI Problems, Techniques, Problem Spaces, Pattern and Data

Search Techniques: Generate and Test, Hill Climbing, Best First Search Problem reduction. Knowledge Representation using Predicate Logic and Rules

Introduction: Hard Computing and Soft Computing.

Characteristics of Neural Networks: Biological Neural Networks and Features, Performance of Computer and Biological Neural Networks

Unit – II:

Artificial Neural Networks: Introduction, Basic models of ANN, important technologies Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network, Associative Memory Networks, Training Algorithms for pattern association, BAM and Hopfield Networks

Unit – III :

Unsupervised Learning Network: Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohenen-Self-Organizing Featue Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks, Special Networks- Introduction o various networks

Unit – IV :

Introduction to Classical Sets (crisp sets) and Fuzzy Sets: operations and Fuzzy sets. Classical Relations and Fuzzy Relations-Cardinality, Operations, Properties and composition, Tolerance and equivalence relations.

Membership functions: Features, Fuzzifications, membership value assignments, Defuzzification

Unit – V :

Fuzzy arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making and Fuzzy Logic Control System.

Genetic Algorithm: Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Techniques

Text Books :

1. Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley, India, 2007.
2. Soft Computing and Intelligent System Design- Fakhreddine O Karry, Clarence D Silva, Pearson Edition, 2004.

Reference Books :

1. Artificial Intelligence and SoftComputing- Behavioural and Cognitive Modelling of the Human Brain- Amit Konar, CRC press, Taylor and Francis Group.
2. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, rp2008.
3. "Soft Computing" Sameer Roy, Pearson Education,2013.
4. A first course in Fuzzy Logic-Hung T Nguyen and Elbert A Walker, CRC. Press Taylor and Francis Group.
5. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford Univ. Press
6. "Artificial Intelligence and Neural Networks" Umarao, Pearson-Sangune

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(17D08104) HIGH PERFORMANCE NETWORKS
(Elective -I)

UNIT- I

Introduction to computer networks - Review of OSI/ISO model – Introduction to high speed networks - High speed LANs – Fast Ethernet - Switched Fast Ethernet - Gigabit Ethernet – ISDN, FDDI, Frame relay - operations and layers.

UNIT- II

Introduction to SONET – SONET/SDH Layers – SONET Frame Structure – Sonet Physical Layer. Introduction ATM – Cell format and Switching Principles – Protocol Architecture – Service categories. TCP/IP protocol Suite – IP Packet Header – TCP packet header – User services – Protocol Operation – Connection Establishment – UDP.

UNIT- III

Congestion control in Data Networks and Internets – Effects of Congestion – Congestion Control in Packet Switched Networks. Frame relay Congestion Control – Traffic rate Management – Congestion Avoidance. ATM Traffic and Congestion Control – Attributes – Traffic Management Framework – Traffic Control – ABR Traffic Management. TCP Traffic Control – Flow Control – TCP Congestion Control – Timer Management – Window Management.

UNIT-IV

Introduction to Quality of Service - Integrated Services – Differentiated Services – Protocols for QoS support - Resource Reservation (RSVP) – Multiprotocol Label Switching (MPLS) – Real-Time Transport Protocol (RTP).

UNIT- V

Introduction to Optical networks – Wavelength division multiplexing (WDM) – Introduction to broadcast-and-select networks - Switch architectures - channel accessing – Wavelength routed networks – Switch architectures - Routing and wavelength assignment – virtual topology design– IP over SONET over ATM over WDM – IP over ATM over WDM – IP over WDM.

Text Books:

1. William Stallings,"High-Speed Networks and Internets", 2nd Edition, Pearson Education, 2002. (Unit I, II, III, and IV).
2. C. Siva Ram Murthy and Mohan Gurusamy, ''WDM Optical Networks: Concepts, Design, and Algorithms", PHI, 2002. (Unit V)

REFERENCE

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical Perspective", 2nd Edition, Morgan Kaufmann (Elsevier Indian Edition), 2004. (Unit II and V).
2. Laon-Garcia and Widjaja,"Communication Networks: Fundamental Concepts and key Architectures, Tata McGrawHill, 2000.
3. Fred Halsall,"Multimedia Communications: Applications, Protocols, and Standards", Pearson Education Asia, 2001. (Unit I and II)

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(17D08105) STORAGE AREA NETWORKS

Elective – II

UNIT I
Basic Networking Concepts and Topologies: OSI Reference Model, Common Network Devices, Network Topologies, MAC Standards - Need for Storage Networks – Storage Devices and Techniques- Evolution and benefits of SANs -SAN Components and Building Blocks- Fibre Channel Basics: Fibre Channel Topologies, Fibre Channel Layers, Classes of Service SAN Topologies

UNIT- II
SANs Fundamentals: SAN Operating Systems Software and Hardware, Types of SAN Technology: Technology and Configuration, High Scalability and Flexibility- Standards-Storage Management Challenges- Networked Storage -Implementation Challenges- Storage Subsystems for Video Services

UNIT III
Storage Networking Architecture- Storage in Storage Networking: Challenges, Cost, Performance -Network in Storage Networking: Fibre Channel, Emerging SAN interconnect Technologies- Basic Software- Advanced Software -Backup Software- ImplementationStrategies

UNIT IV
Storage Network Management- In-Band management- Out-of-Band Management- SNMPHTTP- TELNET -Storage Network Management Issues –Storage Resource Management- Storage Management -Storage, Systems, and Enterprise Management Integration

UNIT V
Designing and building a SAN- Design considerations- Business requirements- Physical layout -Placement -Storage pooling -Data availability- Connectivity- scalability- migration – manageability- fault tolerance and resilience - prevention of congestion- routability- backup and restoration - SAN Security &iSCSI Technology- Basic security guidelines -implementing SAN security -Backup and restoration -iSCSI technology - Future of SANS

Text Books:

1. Storage Area Network Essentials:A complete Guide to Understanding and Implementing SANs(HardCover) By Richard Barker, Paul Massigliar By Wiley 2001.

Reference Books:
1. Meeta Gupta, Storage Area Network Fundamentals , Cisco Press, 2002.
2. Marc Farley: Building Storage Networks, 2nd Edition, Tata McGraw Hill, Osborne, 2001.
3. Tom Clark, "Designing Storage Area Networks", Addison-Wesley Professional, 1st edition, 1999
4. Alex Goldman, "Storage Area Networks Fundamentals", Cisco Press 2002

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(17D08106) NETWORK DESIGN AND MANAGEMENT
(Elective-II)

UNIT I

Network Design: Design Principles - Determining Requirements - Analyzing the Existing Network - Preparing the Preliminary Design - Completing the Final Design Development - Deploying the Network - Monitoring and Redesigning – Maintaining - Design Documentation - Modular Network Design - Hierarchical Network Design - The Cisco Enterprise Composite Network Model.

UNIT II

Technologies - Switching Design: Switching Types - Layer 2 and 3 Switching - Spanning-Tree Protocol - Redundancy in Layer 2 Switched Networks - STP Terminology and Operation – Virtual LANs – Trunks - Inter-VLAN Routing - Multilayer Switching - Cisco Express Forwarding - Switching Security - Switching Design Considerations - IPv4 Routing Design: IPv4 Address Design - Private and Public Addresses – NAT - Subnet Masks - Hierarchical IP Address Design - IPv4 Routing Protocols – Classification - Metrics - Routing Protocol Comparison - IPv4 Routing Protocol Selection.

UNIT III

Network Security Design: Hacking – Vulnerabilities - Design Issues - Human Issues - Implementation Issues – Threats - Reconnaissance Attacks - Access Attacks – Information Disclosure Attacks - Denial of Service Attacks - Threat Defense - Secure Communication - Network Security Best Practices - SAFE Campus Design.

UNIT IV

Wireless LAN Design: Wireless Technology Overview - Wireless Standards - WirelessComponents - Wireless Security - Wireless Security Issues - Wireless Threat Mitigation –Wireless Management - Wireless Design Considerations - Site Survey - WLAN Roaming - Wireless IP Phones - Quality of Service Design - QoS Models – IntServ - DiffServ154 - QoS Tools – Policing and Shaping - Congestion Avoidance - Congestion Management - Link-Specific Tools1 – QoS Design Guidelines.

UNIT V

Network Management Design: ISO Network Management Standard - Protocols and Tools – SNMP – MIB – RMON - Cisco NetFlow – Syslog – CiscoWorks - Network Management Strategy - SLCs and SLAs - IP Service-Level Agreements – Content Networking Design – Case Study – Venti Systems.

TEXT BOOK

1. Diane Tiare and Catherine Paquet, "Campus Network Design Fundamentals", Pearson Education, 2006.

REFERENCE

1. Craig Zacker, "The Complete Reference: Upgrading and Troubleshooting Networks",

Tata McGraw-Hill, 2000.

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(17D25205) SOFTWARE PROJECT MANAGEMENT

(Elective-II)

UNIT I : Project Evaluation And Project Planning

Importance of Software Project Management, Activities Methodologies, Categorization of Software Projects , Setting objectives , Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation, Strategic program Management, Stepwise Project Planning.

UNIT II : Project Life Cycle And Effort

Software process and Process Models, Choice of Process models, mental delivery, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model, Staffing Pattern.

UNIT III : Activity Planning And Risk Management

Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass & Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment, Monitoring, PERT technique, Monte Carlo simulation, Resource Allocation, Creation of critical patterns, Cost schedules.

UNIT IV : Project Management And Control

Framework for Management and control, Collection of data Project termination, Visualizing progress, Cost monitoring, Earned Value Analysis- Project tracking, Change control- Software Configuration Management, Managing contracts, Contract Management.

UNIT V : Staffing In Software Projects Managing people, Organizational behavior, Best methods of staff selection, Motivation, The Oldham-Hackman job characteristic model, Ethical and Programmed concerns, Working in teams, Decision making, Team structures, Virtual teams, Communications genres, Communication plans.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References Books:

1. Robert K. Wysocki "Effective Software Project Management" – Wiley Publication,2011.
2. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

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M.Tech I semester (CN)

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(17D58106) NEURAL NETWORKS

(Elective-II)

UNIT – I

BASICS OF ARTIFICIAL NEURAL NETWORKS: Characteristics of Neural Networks, Historical Development of Neural Network Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws

UNIT II

ACTIVATION AND SYNAPTIC DYNAMICS: Activation Dynamics Models, Synaptic Dynamics Models, Learning Methods, Stability and Convergence, Recall in Neural Networks.

UNIT III

FUNCTIONAL UNITS OF ANN FOR PATTERN RECOGNITION TASKs: Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units: Pattern Recognition Tasks by Feed forward Neural Networks, Pattern Recognition Tasks by Feedback Neural Networks, Pattern Recognition Tasks by Competitive Learning Neural Networks.

UNIT IV

FEEDFORWARD NEURAL NETWORKS: Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks

UNIT V

FEEDBACK NEURAL NETWORKS: Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks, Stochastic Networks and Simulated Annealing, Boltzmann Machine

Text Books:

1. "Artificial Neural Networks", B. Yegnanarayana – PHI Publications

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M.Tech I semester (CN)

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(17D58110) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

1. Write C++ programs to implement the following using an array.

   a) Stack ADT b) Queue ADT

2. Write C++ programs to implement the following using a singly linked list.

   a) Stack ADT b) Queue ADT

3. Write C++ programs to implement the deque (double ended queue) ADT using a doubly linked list and an array.

4. Write a C++ program to perform the following operations:

   a) Insert an element into a binary search tree.

   b) Delete an element from a binary search tree.

   c) Search for a key element in a binary search tree.

5. Write C++ programs that use recursive functions to traverse the given

   binary tree in

   a) Preorder b) inorder and c) postorder.

6. Write C++ programs that use non-recursive functions to traverse the given

   binary tree in

   b) Preorder b) inorder and c) postorder.

7. Write C++ programs for the implementation of bfs and dfs for a given graph.

8. Write C++ programs for implementing the following sorting methods:

   a) Merge sort b) Heap sort

9. Write a C++ program to perform the following operations

   a) Insertion into a B-tree b) Deletion from a B-tree

10. Write a C++ program to perform the following operation

    a) Insertion into an AVL-tree

11. Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.

12. Write a C++ program for implementing Knuth-Morris- Pratt pattern matching algorithm.

(Note: Use Class Templates in the above Programs**)**

References::

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education, 2010.
2. Classic Data Structures by D. Samanta, 2005, PHI
3. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG
6. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
7. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.
8. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press

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(17D08107) NETWORK PROGRAMMING LAB

Objective
- Create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP, UDP layer
- Ability to conduct computer communication network simulations.

1. Implement TCP Echo client and TCP Echo server (Iterative).
2. Implement TCP Echo client and TCP Echo server (Concurrent).
3. Implement TCP daytime client and TCP daytime server (Iterative).
4. Implement TCP daytime client and TCP daytime server (concurrent).
5. Implement UDP Echo Client and UDP Echo Server.
6. Implement UDP daytime Client and UDP daytime server.
7. Implement TCP client and server (concurrent) where client gets input from the user and sends it to server. Server displays it on the screen. Server then gets another input from the user and sends it to client. Client displays it on the screen. The process continues till server or client sends "bye" to the other party.
8. Implement TCP client and server (concurrent) where client requests server to transfer a file. Assume file is smaller than 1K size. If the file is present on the server, it is sent to the client otherwise an error message is sent to client. Client copies the file on the hard disk and disconnects.
9. Implement UDP client and UDP server where server displays the IP address and port number of the client sending the datagram. Client sends a datagram (size 64 bytes) three times to the same server. Server sends the message back to client. Client reports the time elapsed in sending and receiving of the message. Use connected UDP sockets.
10. Write to program to
    i. display name of the host
    ii. all IP addresses of the host.

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(17D08108) NETWORK SECURITY LAB

1. Working with Sniffers for monitoring network communication (Ethereal)

2. Understanding of cryptographic algorithms and implementation of the same in C or C++

3. Using openssl for web server - browser communication

4. Using GNU PGP

5. Performance evaluation of various cryptographic algorithms

6. Using IPTABLES on Linux and setting the filtering rules

7. Configuring S/MIME for e-mail communication

8. Understanding the buffer overflow and format string attacks

9. Using NMAP for ports monitoring

10. Implementation of proxy based security protocols in C or C++ with features like confidentiality, integrity and authentication

Following are some of the web links, which help to solve the above assignments

- http://linuxcommand.org/man_pages/openssl1.html
- http://www.openssl.org/docs/apps/openssl.html
- http://www.queen.clara.net/pgp/art3.html
- http://www.ccs.ornl.gov/~hongo/main/resources/contrib/gpg-howto/gpg-howto.html
- https://netfiles.uiuc.edu/ehowes/www/gpg/gpg-com-0.htm
- http://www.ethereal.com/docs/user-guide/

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(17D58202) MOBILE APPLICATION DEVELOPMENT

Objectives:
- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming.

Out comes:
- Create data sharing with different applications and sending and intercepting SMS.
- Develop applications using services and publishing android applications.
- To demonstrate their skills of using Android software development tools

Unit 1:

Basics of Mobile Applications Development:

Tools: Eclipse ADT, Android Studio.

Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons

Unit 2: Building Blocks for Android Application Design:

Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation.

Utilizing Resources and Media Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets

Unit 3: Using Selection widgets and Debugging:

Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Debugging Application, Using the Debug Perspective.

Displaying And Fetching Information Using Dialogs and Fragments: What Are Dialogs?, Selecting the Date and Time in One Application, Fragments, Creating Fragments with java Code, Creating Special Fragments

Unit 4: Building Menus: Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Tabbed Action Bar, Creating a Drop-Down List Action Bar

Unit 5 Storing Data & Communicating with SMS and Emails:

Using the SQLiteOpenHelperclasss, Accessing Databases with the ADB, Creating a Data Entry Form.

Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working With Telephony Manager.

Text Books
1. Android Programming by B.M Harwani, Pearson Education, 2013.

References Text Books:

1. Android application Development for Java Programmers, James C Sheusi, Cengage Learning
2. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
3. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.
4. Beginning Android 4 applications development, Wei- Meng Lee, Wiley India,2013
5. PawPrints Learning Technologies, Beginning Android Development: Create Your Own Android Apps Today, 2014.
6. Erik Hellman, Android Programming: Pushing the Limits, John Wiley and sons ltd, 2014.
7. Neil Smyth, Android Studio Development Essentials.
8. Joseph Annuzzi,Jr, Lauren Darcey, Introduction to Android Application Development, Addison-Wesley, Fourth Edition.

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(17D08201) WIRELESS SENSOR NETWORKS

Course objectives: This course will enable students to
- Demonstrate the design space and conduct trade-off analysis between performance and resources.
  - Assess coverage and conduct node deployment planning.
  - Devise appropriate data dissemination protocols and model links cost.
  - Determine suitable medium access protocols and radio hardware.
  - Illustrate sensor networks using commercial components.
  - Discuss quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints

Course outcomes:
  The students shall able to:
  - Apply in the context of wireless sensor networks and explain elements of distributed
  - computing and network protocol design
  - Contrast Various hardware, software platforms that exist for sensor networks
  - Summarize various network level protocols for MAC, routing, time synchronization, aggregation, consensus and distributed tracking

Unit: 1
Introduction, Overview and Applications of Wireless Sensor Networks Introduction, Basic overview of the Technology, Applications of Wireless Sensor Networks: Introduction, Background, Range of Applications, Examples of Category 2 WSN Applications, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology.

Unit: II
Basic Wireless Sensor Technology and Systems: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Transmission Technology and Systems: Introduction, Radio Technology Primer, Available Wireless Technologies

Unit III:
MAC and Routing Protocols for Wireless Sensor Networks: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case Study, IEEE 802.15.4 LR-WPANs Standard Case Study. Routing Protocols for Wireless Sensor Networks: Introduction, Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs

Unit IV:
Transport Control and Middleware for Wireless Sensor Networks: Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. Middleware for Wireless Sensor Networks: Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware.

Unit V :
Network Management and Operating System for Wireless Sensor Networks: Introduction, Network Management Requirements, Traditional Network Management Models, Network Management Design Issues. Operating Systems for Wireless Sensor Networks: Introduction, Operating System Design Issues, Examples of Operating Systems.

Text Books:
1. KAZEM SOHRABY, DANIEL MINOLI, TAIEB ZNATI, "Wireless Sensor Networks: Technology, Protocols and Applications:, WILEY , Second Edition (Indian) , 2014.

Reference Books:
1. Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

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(17D58201) BIG DATA ANALYTICS

Objectives:

- To learn to analyze the big data using intelligent techniques.

- To understand the various search methods and visualization techniques.

- To learn to various techniques for mining data stream.

- To understand the applications using Map Reduce Concepts.

Outcomes:

On completion of this course the student will able to

- Analyze the big data analytics techniques for useful business application.

- Design efficient algorithms for mining the data from large volumes.

- Analyze the HADOOP and Map Reduce technologies associated with big data analytics.

- Explore on big data applications using Pig and Hive.

UNIT-I

Introduction to Big Data

Introduction to Big Data Platform – Challenges of Conventional System – Intelligent data analysis – Nature of Data – Analytic Processes and Tool – Analysis vs Reporting – Modern Data Analytic Tool – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Prediction Error.

UNIT- II

Mining Data Streams

Introduction To Stream Concepts – Stream Data Model and Architecture - Stream Computing – Sampling Data in a Stream – Filtering Stream – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT – III

Hadoop

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop – Analyzing the Data with Hadoop – Scaling Out – Hadoop Streaming – Design of HDFS- Java interfaces to HDFSBasics- Developing a Map Reduce Application – How Map Reduce Works – Anatomy of a Map Reduce Job run – Failures – Job Scheduling – Shuffle and Sort – Task Execution – Map Reduce Types and Formats – Map Reduce Features.

UNIT – IV

Hadoop Environment

Setting up a Hadoop Cluster – Cluster specification – Cluster Setup and Installation –Hadoop Configuration – Security in Hadoop – Administering Hadoop – HDFS – Monitoring – Maintence – Hadoop Benchmarks – Hadoop in the Cloud.

UNIT –V

Frameworks

Applications on Big Data Using Pig and Hive – Data Processing operators in Pig – Hive Services – HiveQL – Querying Data in Hive – fundamentals of HBase and Zookeeper – IBM Info Sphere Big Insights and Streams. Visualization - Visual data analysis techniques, interaction techniques; Systems and applications.

Text Books:

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
2. Tom White, Hadoop: The Definitive Guide Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill Publishing, 2012.
4. AnandRajaraman and Jeffrey David UIIman, Mining of Massive Datasets Cambridge University Press, 2012.

Reference Books:

1. Bill Franks, Taming the big Data tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
3. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition.
4. Elsevier, Reprinted 2008. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007.

5. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data the IBM Big Data Platform, Tata McGraw Hill Publications, 2012.

6. Michael Minelli (Author), Michele Chambers (Author), AmbigaDhirraj (Author), Big Data, BigSnalytics.

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(17D08202) DIGITAL AND CYBER FORENSICS
Elective-III

Course Objectives:

- Understand digital and Cyber Forensics
- Ability to prepare for digital evidence investigations
- Know the importance of maintaining professional conduct.
- Study the requirements for data recovery workstations and software.
- Ability to review a case to identify requirements and plan your investigation.

Course Outcomes:

- Select and apply current computer forensics tools.
- Identify and apply current practices for processing crime and incident scenes.
- Apply digital evidence controls.
- Conduct basic cyber forensic analysis.

Unit- I

Network Forensics: Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing - Internet Fraud

Unit- II

Systems Investigation and Ethical Issues: Data Analysis Techniques - Investigating Live Systems (Windows &UNIX) - Investigating Hacker Tools - Ethical Issues – Cybercrime

Unit- III

Mobile phone forensics: crime and mobile phones, evidences, forensic procedures, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques.

Unit- IV

Digital forensics: Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination

Unit- V

Digital forensics examination principles: Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems- audit and logs- Evidence interpretation: Data content and context

Text Books

1. Peter Stephenson, "Investigating Computer Crime: A Handbook for Corporate Investigations", Sept 1999
2. Eoghan Casey, "Handbook Computer Crime Investigation's Forensic Tools and Technology", Academic Press, 1st Edition, 2001
3. Iosif I. Androulidakis, " Mobile phone security and forensics: A practical approach", Springer publications, 2012
4. Andrew Hoog, " Android Forensics: Investigation, Analysis and Mobile Security for Google Android", Elsevier publications, 2011
5. Angus M.Marshall, " Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, 2008

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1. Skoudis. E., Perlman. R. Counter Hack: *A Step-by-Step Guide to Computer Attacks and Effective Defenses.*Prentice Hall Professional Technical Reference. 2001.
2. Bill Nelson,Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations",course technology,4thedition,ISBN: 1-435-49883-6

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(17D08203) INTERNET SECURITY PROTOCOLS
Elective-III

Course Objectives:
- Study the advances in Internet security threats, vulnerabilities of protocols and the different types of attacks
- Understand protocols, devices and tools used in securing networked applications and systems
- Know the current research topics and issues in Internet security
- Ability to analyze and secure networked systems

Course Outcomes:
- Assess Internet security threats
- Describe the different Internet attacks
- Identify potential vulnerabilities in internet
- Design new security protocols for email, web and other Internet applications
- Describe tools used for the prevention and detection of Internet attacks

Unit- I

TCP/IP Suite and Internet Stack Protocols: Network Layer Protocols, Transport Layer Protocols, World Wide Web, File Transfer, Network Management Service, Converting IP Addresses, Routing Protocols, Remote System Programs

Unit – II

Symmetric Block Ciphers: Data Encryption Standard, International Data Encryption Algorithm. Secure Hash Algorithm (SHA-1), Diffie–Hellman Exponential Key Exchange, RSA Public-key Cryptosystem.

Unit-III

ElGamals Public-key Cryptosystem, Schnorr's Public-key Cryptosystem, Digital Signature Algorithm. Public-key Infrastructure: Internet Publications for Standards, Digital Signing Techniques, Key Elements for PKI Operations.

Unit-IV

Network Layer Security: IPsec Protocol, Key Management Protocol for IPsec. Transport Layer Security: SSLv3 and TLSv1: SSL Protocol, TLS Protocol. Electronic Mail Security: PGP, S/MIME: PGP, S/MIME.

Unit – V

Factoring and Computing Discrete Logarithms: Algorithms for Factoring, Algorithms for Computing Discrete Logarithms. Internet Firewalls for Trusted Systems: Role of Firewalls, Firewall-Related Terminology, Types of Firewalls, Firewall Designs, SET for E-commerce Transactions

Text Books

1. Rhee, Man Young. *Internet security: cryptographic principles, algorithms and protocols*. John Wiley & Sons, 2003.
2. Katz, Jonathan, and Yehuda Lindell. "Introduction to modern cryptography: principles and protocols." (2007).

References

1. Zhang, Yan, Laurence T. Yang, and Jianhua Ma, eds. *Unlicensed Mobile Access Technology: Protocols, Architectures, Security, Standards and Applications*. CRC press, 2008.
2. Zhang, Yan, Laurence T. Yang, and Jiming Chen, eds. *RFID and sensor networks: architectures, protocols, security, and integrations*. CRC Press, 2009.

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(17D58107) ARTIFICIAL INTELLIGENCE
Elective-III

Course Objective:
- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Learning Outcome:
- Possess the ability to formulate an efficient problem space for a problem expressed in English
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and Machine Learning.

Unit – I

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art.

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit – II

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

Unit – III

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

Unit – IV

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

Unit – V

Learning Probabilistic Models: Statistical Learning, Learning with Complete data, Learning with Hidden variables: The EM Algorithm.

Text Books :

1. "Artificial Intelligence A Modern Approach", Stuart J. Russell & Peter Norvig – Pearson.
2. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.

Reference Books:

1. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier

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(17D25201) ADVANCES IN SOFTWARE TESTING
Elective-III

Course objectives:
- Study the significance of testing
- Study the testing to be done at various levels
- Understand the procedure for designing test cases

Course Outcomes:
- Ability to systematically test the applications
- Ability to write test cases
- Ability to use testing tools effectively

UNIT I
Control flow graph – basic blocks, flow graphs, paths, basic paths, path conditions and domains, Dominators and post-dominators; Program dependence graph – data dependence, control dependence, call graph,
Tests generation - Test selection Problem, equivalence partitioning, Equivalence class partitioning, boundary value analysis and category partitioning method.

UNIT II
Finite state machines (FSM) - properties of FSM, Conformance testing, test generation, test optimization, Fault detection. **Combinatorial designs** – combinatorial test design process. **Pairwise design**: Binary factors and multi-valued factors. **Orthogonal arrays** and multi level orthogonal arrays.

UNIT III
Test Adequacy: Basics, measurement of test adequacy, infeasibility and test adequacy. Adequacy criteria based control – statement, block, conditions and decisions coverage techniques. Basics of Junit tool for Java.
Metrics
Importance of Metrics in Testing - Effectiveness of Testing – Defect Density – Defect Leakage Ratio – Residual Defect Density – Test Team Efficiency – Test Case Efficiency.

UNIT IV
Regression Testing
What is Regression Testing? Regression test process. Regression test selection techniques: Test all, Random selection, modification traversing tests, using execution trace. Test minimization and prioritization.

UNIT V
Non-functional testing
Load testing, performance testing, GUI testing, Security testing techniques and tools.
Automation: Case studies functional test automation using Selenium.

Text Books:
1. Aditya P Mathur, Foundations of software testing, 2nd edition, Pearson , 2013.
2. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dream tech press, 2003.

Reference Books:
1. M G Limaye, "Software Testing – Principles, Techniques and Tools", Tata McGraw Hill, 2009.
2. Edward Kit, "Software Testing in the Real World - Improving the Process", Pearson Education, 2004.
3. William E. Perry, "Effective methods for software testing", 2nd Edition, John Wiley, 2000.

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(17D08204) MOBILE ADHOC NETWORKS
Elective-IV

Course Objective:
- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

Course Outcomes:
- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications

UNIT I

Introduction to Ad Hoc Networks:

Characteristics of MANETs, Applications of MANETs and challenges of

MANETs -Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT II

Data Transmission:

Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TCPover Ad Hoc:

TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT III

Basics of Wireless, Sensors and Applications:

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV

Data Retrieval in Sensor Networks:

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security:

Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT V

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System:TinyOS -Imperative Language:nesC, Dataflow style language: TinyGALS,Node-Level Simulators, ns-2 and its sensor network extension.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos CorderioDharma P.Aggarwal,World Scientific Publications, March 2006,ISBN –981-256-681-3

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 (Morgan Kauffman)

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(17D58206) MACHINE LEARNING
Elective-IV

Objectives:

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more

UNIT I INTRODUCTION

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

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING

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

UNIT IV INSTANCE BASED LEARNING

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT V ADVANCED LEARNING

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

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

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(17D58207) CLOUD COMPUTING
Elective-IV

Objectives

- To introduce the basis of Cloud Computing
- To educate the cloud working function
- To allow computer system resources to be used in an efficient manner
- Makes the environment to the cloud.

Outcomes

On successful completion of the course, students will be able to:
- Understand the concepts of cloud computing and its related techniques.
- Provide a pleasant and effective user interface.

UNIT-I
Introduction to cloud computing – The Evolution of cloud computing – Hardware Evolution- Internet Software Evolution – Server Virtualization – Web Services Deliver from the cloud– Communication-as-a-service–Infrastructure-as-a-service–Monitoring-as-a-service–Platform- as-a-Service - Software-as-a-service – Building Cloud Network.

UNIT-II
Federation in the cloud – presence in the cloud – Privacy and its Relation to cloud-Based Information Systems– Security in the cloud – Common Standards in the cloud-End-User Access to the cloud Computing.

UNIT-III
Introduction – Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups- Standards Bodies and Working Groups- Service Oriented Architecture- Business Process Execution Language- Interoperability Standards for Data Center Management – Utility Computing Technology- Virtualization – Hyper Threading – Blade Servers- Automated Provisioning- Policy Based Automation- Application Management – Evaluating Utility Management Technology – Virtual Test and development Environment – Data Center Challenges and Solutions – Automating the Data Center.

UNIT-IV
Software Utility Application Architecture – Characteristics of a SaaS – Software Utility Applications – Cost Versus Value – Software Application Services Framework – Common Enablers – Conceptual view to Reality – Business profits – Implementing Database System for Multitenant Architecture.

UNIT-V
Other Design Consideration – Design of a Web Services Metering Interface – Application Monitoring Implementation – A Design for an update and Notification Policy – Transforming to Software as a Service – Application Transformation Program – Business Model Scenarios – Virtual Services for Organizations – The Future.

Text Books:

1. Guy Bunker and Darren Thomson, Delivering utility Computing, John Wiley & Sons Ltd, 2012.

References Books:

1. John W. Rittinghouse and Ames F. Ransome, Cloud Computing Implementation , Management and security, CRC press & Francis Group, Boca Raton London New York. 2010.

2. Alfredo Mendroza, Utility Computing Technologies, Standards, and Strategies Artech House INC, 2007.

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(17D25208) SECURE SOFTWARE ENGINEERING
Elective-IV

Course Objectives:

- Students will demonstrate knowledge of the distinction between critical and non-critical systems.

- Students will demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.

- Students will demonstrate an understanding of the proper contents of a software requirements document for secure software engineering.

- Students will author a formal specification for secure software systems.

- Students will demonstrate an understanding of distributed system architectures and application architectures.

- Students will demonstrate an understanding of the differences between real-time and non-real time systems.

Course Outcomes:

- Ability to identify specific components of a software design that can be targeted for reuse.
- Ability to learn software testing plan and metrics for secure software engineering.

UNIT I

Why Is Security a Software Issue?
Introduction, The problem, Software assurance and software security, Threats to software security, Sources of software insecurity, the benefits of detecting software security defects early, managing secure software development.

What Makes Software Secure?
Defining properties of secure software, How to influence the security properties of software, How to assert and specify desired security properties.

UNIT II
Requirements Engineering for Secure Software
Introduction, Misuse and Abuse Cases, The SQUARE process model: SQUARE sample outputs, Requirements elicitation, Requirements Prioritization.
Secure Software Architecture and Design
Introduction, Software security practices for architecture and design: Architectural risk analysis. Software security knowledge for architecture and design: Security principles, Security guidelines, and Attack patterns.

UNIT III
Considerations for Secure Coding and Testing
Introduction, Code analysis, Coding practices, Software security testing, Security testing considerations throughout the SDLC.
Security and Complexity: System Assembly Challenges
Introduction, Security failures, Functional and attacker perspectives for security analysis, System complexity drivers and security, Deep technical problem complexity.

UNIT IV
Governance, and Managing for More Secure Software
Introduction, Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, maturity of practice.

UNIT V
Security Metrics
Defining security metrics, Diagnosing problems and measuring technical security, Analysis Techniques, Organize, aggregate, and analyze data to bring out key insights.

TEXT BOOKS
1. Software Security Engineering: A Guide for Project Managers, by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley , 1st edition, 2008.
2. Security Metrics: Replacing Fear, Uncertainty, and Doubt , by Andrew Jaquith, Addison-Wesley , 1st edition , 2007.

REFERENCES

1. Integrating Security and Software Engineering: Advances and Future Vision, by Haralambos Mouratidis, Paolo Giorgini, IGI Global, 2006.
2. Software Security: Building Security In , by Gary McGraw , Addison-Wesley, 2006
3. The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities, by Mark Dowd, John McDonald, Justin Schuh, Addison-Wesley, 1st edition, 2006

4. Building Secure Software: How to Avoid Security Problems the Right Way by John Viega,Gary McGraw, Addison-Wesley, 2001

5. Writing Secure Code, by M. Howard, D. LeBlanc, Microsoft Press, 2nd Edition, 2003.

6. Exploiting Software: How to break code, by G. Hoglund, G. McGraw, Addison Wesley, 2004.

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(17D58210) MOBILE APPLICATION DEVELOPMENT LAB

Course Objective:

- In this lab, a student is expected to design, implement, document and present a mobile client/server system using standard Java and Java 2 Micro Edition (J2ME) platform.

- Specifically it is required to design and implement a system that consists mainly of a mobile client (MC) and a Proxy Server (PS).

- MC will be written in J2ME, MIDP 2.0, while PS will be written in standard Java. It is necessary to use a mobile phone emulator to develop and demonstrate the experiments.

- It may be necessary to use other components or existing resources (servers) as needed. For instance a database local to PS or a web service available on the Internet that can be invoked by the PS.

Course Outcomes:

- Demonstrate J2ME 2.5.2 Wireless Toolkit/Android studio and Layout Managers.

- Design Graphical primitives in J2ME 2.5.2 Wireless Toolkit/Android studio.

- Implement Multi-threading and GPS location information.

- Deploy applications to hand-held devices.

Using Wireless Markup language develop the APP using Android OS

1. Design and develop an Mobile App for smart phones The Easy Unit Converter using Android. This application should have approximately 20 categories to be used in your daily life. It includes following units: Acceleration, Angle, Area, Circle, Capacitor, Cooking, Data Size, Density, Data Transfer rate, Electric Current, Energy, Flow Rate, and Force.
2. Design and develop an Mobile App for smart phones Currency Converter. .This applications should synchronize online as you run it and sends you back the latest and most reliable exchange rates possible.
   This application should support following conversions:

EUR->Euro
GBP->British Pound
USD->United States Dollar
AUD->Australian Dollar
CAD->Canadian Dollar
CHF->Swiss Franc
CNY->Chinese Yuan
HKD->Hong Kong Dollar
IDR->Indonesian Rupiah
INR->Indian Rupee
JPY->Japanese Yen
THB->Thai Bah

3. Design and develop an Mobile App game for smart phones The Tic Tac Toe using Android.
4. Design and develop an Mobile App for smart phones ,The Health Monitoring System using Android. This App should record Biochemistry Lab Parameters and if abnormal shold send an SMS to doctor for Medications.

5. Design and develop an Mobile App for smart phones The Expense Manager using Android. This is an application for managing your expenses and incomes: Tracking expenses and incomes by week, month and year as well as by categories, Multiple accounts in multiple currencies, Schedule the payments and recurring payments, Take a picture of receipt, Payment alerts, Budget by day, week, month and year, Search and reports, Import and export account activities in CSV for desktop software, Customize expense categories, payer/payer, payment methods, date format, white or black background, button style etc, Account transfer, Convenient tools such calculator, currency converter, tip calculator, sales and tax calculator and credit card calculator.

References:

1. Mobile Computing: (technologies and Applications- N. N. Jani S chand

2. B.M.Hirwani- Android programming Pearson publications-2013

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(17D08205) WIRELESS SENSOR NETWORKS LAB

Course Objectives:

The objective of this course is to make the students
1. To Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology
2. Understand the medium access control protocols and address physical layer issues
3. Learn key routing protocols for sensor networks and main design issues
4. Learn transport layer protocols for sensor networks, and design requirements
5. Understand the Sensor management, sensor network middleware, operating systems.

Course Outcomes:

1. Have knowledge and understanding of basic WSN technology and supporting protocols and Technology
2. Have knowledge and to Identify medium access control protocols and address physical layer issues
3. Have knowledge routing protocols for sensor networks and main design issues
4. Have knowledge of transport layer protocols for sensor networks, and design requirements
5. Understand Sensor management, sensor network middleware, operating systems

Experiments
1. Basics of Network Simulation and Wireless Sensor Networks.
2. Simulating a Wireless Sensor Network.
3. Introduction to nesC Programming.
4. Basics of WSN programming using TinyOS.
5. Sensing data using WSN motes.
6. Collecting, disseminating and processing data in WSNs and using Deluge to disseminate programs.
7. Introduction to the use of cryptographically secured (private key) communication in WSNs.
8. Using public key cryptography in WSNs.
9. Sensing audio data and interpreting results.
10. Describe the RF communication using Wireless sensor nodes.
11. Sensing positioning data using GPS and transmitting it.
12. Wireless Sensor Network Duty Cycle Implementation vs. Analysis of Power Consumption.
13. Visualization in Wireless Sensor Networks.

References:

1. Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing
   Approach", Elsevier, 2007.

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(17D58209) MAPREDUCE PROGRAMMING LAB

Objectives:

1. Getting familiar with Hadoop distributions, configure Hadoop and perform File Management Tasks
2. To understand Map Reduce in Hadoop works
3. To implement Map Reduce programs
4. Understanding Map Reduce support for debugging
5. Understanding new approaches for building Hadoop Map Reduce programs for real-time applications

Outcomes:

1. Configure Hadoop and perform File Management Tasks
2. Applying Map Reduce programs to real time issues like word count, weather dataset and sales of a company
3. Critically analyze huge data set using hadoop distributed file systems and mapreduce programs

1. Install Apache Hadoop
2. Write a map reduce program to calculate the frequency of a given word in a given file?
3. Write a Map Reduce program to find the maximum temperature in each year?
4. Write a Map Reduce program to find the grades of student's?
5. Write a map reduce program to implement Matrix Multiplication?
6. Write a map reduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year?
7. Write a map reduce to analyze weather data set and print whether the day is shinny or cool day?

8. Write a map reduce program to find the number of products sold in each country by considering sales data containing fields like

Transaction_date	Product	Price	Payment_Type	Name	City	State	Country	Account_Created	Last_Login	Latitude	Longitude

9. Write a map reduce program to find the tags associated with each movie by analyzing movielens data?
10. XYZ.com is an online music website where users listen to various tracks, the data gets collected like shown below.
The data is coming in log files and looks like as shown below.

UserId	TrackId	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0

Write a map reduce program to get the following
- Number of unique listeners
- Number of times the track was shared with others
- Number of times the track was listened to on the radio
- Number of times the track was listened to in total
- Number of times the track was skipped on the radio

11. Write a map reduce program to find the frequency of books published each year and find in which year maximum number of books were published using the following data?

Title	Author	Published year	Author country	Language	No of pages

12. Write a map reduce program to analyze Titanic data and to find

The average age of the people (both male and female) who died in the tragedy
How many persons survived – traveling class wise.

The titanic data will be..
Column 1 : PassengerId   Column 2 : Survived (survived=0 & died=1)
Column 3 : Pclass   Column 4 : Name   Column 5 : Sex

Column 6 : Age   Column 7 : SibSp   Column 8 : Parch

Column 9 : Ticket   Column 10 : Fare   Column   11   :
Cabin
Column 12 : Embarked

13. Write a map reduce program to analyze Uber data set to find the **days on which each basement has more trips using the following dataset**

The Uber dataset consists of four columns they are dispatching_base_number, date, active_vehicles and trips.

Reference:

1. Srinath Perera and Thilina Gunarathne Hadoop MapReduce Cookbook, Packt publishing, 2003.
2. Bill Franks, Taming the big Data tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.

3. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
4. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition.
5. Elsevier, Reprinted 2008. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007.

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M.Tech III semester (CN)

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(17D20301) RESEARCH METHODOLOGY

(Elective V-OPEN ELECTIVE)

UNIT I

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

UNIT II

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.

Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.

Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

UNIT III

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

UNIT IV

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

UNIT V

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Text Books:

1. Research Methodology:Methods And Techniques – C.R.Kothari, 2nd Edition,New Age International Publishers.
2. Research Methodology: A Step By Step Guide For Beginners- Ranjit Kumar, Sage Publications (Available As Pdf On Internet)
3. Research Methodology And Statistical Tools – P.Narayana Reddy And G.V.R.K.Acharyulu, 1st Edition,Excel Books,New Delhi.

REFERENCES:

1. Scientists Must Write - Robert Barrass (Available As Pdf On Internet)

2. Crafting Your Research Future –Charles X. Ling And Quiang Yang (Available

As Pdf On Internet)

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M.Tech III semester (CN)

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(17D20302) HUMAN VALUES AND PROFESSIONAL ETHICS

(Elective V-OPEN ELECTIVE)

Unit I:

HUMAN VALUES:Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II:

ENGINEERING ETHICS: Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg‟s theory- Gilligan‟s theory-Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

Unit III :

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV:

ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK: Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing riskSafety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

UINIT V:

GLOBAL ISSUES: Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of

Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics .

Text Books :

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.

2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.

4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.

5. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.

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M.Tech III semester (CN)

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(17D20303) INTELLECTUAL PROPERTY RIGHTS

(Elective V-OPEN ELECTIVE)

UNIT – I

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

UNIT – II

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

UNIT – III

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

UNIT – IV

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

UNIT – V

New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

TEXT BOOKS & REFERENCES:

1. Intellectual Property Right, Deborah. E. Bouchoux, Cengage Learing.

2. Intellectual Property Right – Nleashmy The Knowledge Economy, Prabuddha Ganguli,

Tate Mc Graw Hill Publishing Company Ltd.,