JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D08101	Data Networks	PC	3	0	0	3
2.	21D58101	Advanced Data Structures And Algorithms	PC	3	0	0	3
3.	21D08102a 21D08102b 21D08102c	**Program Elective Course - I** Real Time Systems Network Security Cloud Computing	PE	3	0	0	3
4.	21D58204a 21D08103a 21D58104b	**Program Elective Course - II** Distributed and Parallel Systems Network Coding Design Patterns	PE	3	0	0	3
5.	21D08104	Data Networks Lab	PC	0	0	4	2
6.	21D58105	Advanced Data Structures and Algorithms Lab	PC	0	0	4	2
7.	21DRM101	Research Methodology and IPR	MC	2	0	0	2
8.	21DAC101a 21DAC101b 21DAC101c	**Audit Course – I** English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	AC	2	0	0	0
Total							**18**

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COURSE STRUCTURE

SEMESTER – II

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D08201	Network Programming	PC	3	0	0	3
2.	21D58202	Internet of Things Protocol Engineering	PC	3	0	0	3
3.	21D08202a 21D08202b 21D08202c	**Program Elective Course – III** MEAN Stack Development Optical Networks Design of Secure Protocols	PE	3	0	0	3
4.	21D08203a 21D08203b 21D08203c	**Program Elective Course - IV** Mobile Application Development Social Network Analysis Advanced Cryptography	PE	3	0	0	3
5.	21D08204	Network Programming Laboratory	PC	0	0	4	2
6.	21D58206	Internet Of Things Protocol Engineering Lab	PC	0	0	4	2
7.	21D08205	Technical seminar	PR	0	0	4	2
8.	21DAC201a 21DAC201b 21DAC201c	**Audit Course – II** Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							**18**

SEMSTER - III

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S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D08301a 21D58201 21D08301b	**Program Elective Course – V** Cluster Computing Operating System Internals Architecture of Software Defined Networks	PE	3	0	0	3
2.	21DOE301b 21DOE301c 21DOE301f	**Open Elective** Industrial Safety Business Analytics Optimization Techniques	OE	3	0	0	3
3.	21D08302	Dissertation Phase – I	PR	0	0	20	10
4.	21D08303	Co-curricular Activities					2
		Total					**18**

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D08401	Dissertation Phase – II	PR	0	0	32	16
Total							**16**

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COURSE STRUCTURE

Course Code	DATA NETWORKS	L	T	P	C
21D08101		3	0	0	3
	Semester	**I**			

Course Objectives:

- To learn the basic concepts of networking
- To understand various transmission media.
- To Analyze digital communication concepts.
- To understand role of wireless networks in data communication.

Course Outcomes (CO): Student will be able to

- Understand the basic network terminology
- Understand digital and analog transmission of data.
- Analyze various digital communication strategies.
- Recognize the use of transport layer in data communication.
- Identify the usage of Wireless networks.

UNIT - I	Lecture Hrs:10

INTRODUCTION TO NETWORKS: Data Communication: Components - Protocols and Standards - Standard making organizations - data rate and Channel capacity, Line configuration, Topology of networks, Transmission modes, Digital Data Transmission, Categories of Networks, Inter-Networks, OSI model, TCP/IP Model, Networking and internetworking devices, switching: Circuit switching - Packet switching - Message switching.

UNIT - II	Lecture Hrs:9

Digital Transmission: Digital to digital conversion, Analog to Digital conversion, Transmission Modes, Analog Transmission: Digital to Analog conversion, Analog to Digital Conversion.

UNIT - III	Lecture Hrs:9

Digital Communication basics: Transmission Media, Sources of Signal Impairment, Asynchronous Transmission, Synchronous Transmission, Error Detection Methods, Protocol Basics.

UNIT - IV	Lecture Hrs:9

TRANSPORT LAYER: Introduction and Transport Layer Services, Multiplexing and De-multiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection Oriented TCP, Principles of Congestion Control: ATM ABR Congestion Control - TCP Congestion Control

UNIT - V	Lecture Hrs:9

DATA LINK LAYER AND WIRELESS NETWORKS: Introduction to Data link layer, Error detection: VRC - LRC – CRC - Checksum and Error correction: Hamming Code, Reliable transmission: Flow Control and Error Control - Token bus - Token ring - Medium Access control: TDMA, FDMA – CDMA – Aloha - CSMA/CA - CSMA/CD Wireless Networks: Introduction to Wi-fi – Wimax – MANET – VANET - WSN.

Textbooks:

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top Down Approach", 5th Edition, Pearson Publications, 2012.
2. Behrouz A. Forouzan, "Data Communication and Networking" 2nd Edition, McGraw- Hill, 2003.
3. Multimedia Communications by Fred Halshall, 4th Edition, Pearson education.

Reference Books:

1. William Stallings, "Data and Computer Communication", Prentice Hall of India.Eighth edition.
2. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.

Course Code	ADVANCED DATA STRUCTURES AND	L	T	P	C

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21D58101	**ALGORITHMS (Common to M.Tech CSE, CN, SE,AI & ML)**	**3**	**0**	**0**	**3**
	Semester	**I**			

Course Objectives:

- To understand concepts of dictionaries and hash tables.
- To implement lists and trees.
- To analyze usage of B trees, Splay trees and 2-3 trees.
- To understand the importance of text processing and computational Geometry.

Course Outcomes (CO): Student will be able to

- Understand the implementation of symbol table using hashing techniques
- Apply advanced abstract data type (ADT) and data structures in solving real world
- problem
- Effectively combine the fundamental data structures and algorithmic techniques in
- building a solution to a given problem
- Develop algorithms for text processing applications

UNIT - I		Lecture Hrs:

Dictionaries : Definition, Dictionary Abstract Data Type, 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		Lecture Hrs:

Skip Lists : Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, Trees: Binary Search Trees (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.

UNIT - III		Lecture Hrs:

2-3 Trees , Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, B-Trees: Advantage of B- trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3 Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.

UNIT - IV		Lecture Hrs:

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

UNIT - V		Lecture Hrs:

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

Textbooks:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004.
2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009

Reference books:

1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, First Edition, Wiley, 2006.

Course Code	**REAL TIME SYSTEMS**	**L**	**T**	**P**	**C**

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COURSE STRUCTURE

21D08102a		**3**	**0**	**0**	**3**
	Semester	**I**			

Course Objectives:

- To understand the basic concepts of Real time systems.
- To understand fault tolerant strategies in implementation of real time systems.
- To analyze the importance of Fault Tolerant Design and Fault Tolerant Computing.
- To identify need of Real Time Embedded Systems.

Course Outcomes (CO): Student will be able to

- Understand the requirements of a real-time application and analyze the performance of different task scheduling algorithms for real-time systems.
- Understand the basic concepts of fault-tolerance and different fault-tolerance techniques available for real- time systems.
- Use simulated software to develop and test different fault tolerant models.
- Understand the concept of embedded systems and use various software tools for development of embedded systems.

UNIT - I	Lecture Hrs:9

Introduction to Real-Time systems, applications of Real-Time systems, basic model of Real-Time systems, characteristics of Real-Time systems, types of Real-Time systems: hard, firm, soft, timing constraints, modeling timing constraints.

UNIT - II	Lecture Hrs:9

Real-Time task scheduling: basic concepts, clock driven scheduling, table driven scheduling, cyclic, schedulers, hybrid schedulers, event driven scheduling, EDF Scheduling, RMA, DMA, resource sharingamong RT tasks, Priority inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol.

UNIT - III	Lecture Hrs:9

Introduction to Fault Tolerant Computing: Basic concepts and Fault tolerant scheduling of tasks Faults and their manifestations, Fault/error modelling, Reliability, availability and maintainability analysis, System evaluation, performance reliability trade-offs. System level fault diagnosis, Hardware and software redundancy techniques.

UNIT - IV	Lecture Hrs:9

Fault tolerant system design methods, Mobile computing and Mobile communication environment, Fault injection methods, Software fault tolerance, testing of fault tolerant software, fault modeling, built in self-test, data compression, error correcting codes, simulation of software/hardware, fault tolerant system design, CAD tools for design for testability.

UNIT - V	Lecture Hrs:9

Real-Time Embedded system, Need of well tested and debugged RTOS, Introduction to C/OS II. Case Studies of programming with RTOS: Smart card embedded system, Hardware and Software co-design: specification and design of an embedded system use of software tools for development of an embedded system. Recent advances in embedded applications.

Textbooks:

1. R. Mall, Real-Time Systems, Pearson, 2007
2. P. A. Laplante, Real-Time Systems Design & Analysis, Willey, 2011

Reference Books:

1. S. V. Iyer& P. Gupat, Embedded Real-Time System Programming, Tata McGraw Hill, 2004
2. . R. Kamal, Embedded System Architecture, Programming and Design, Tata McGraw Hill, 2007

Course Code	**NETWORK SECURITY**	**L**	**T**	**P**	**C**
21D08102b		**3**	**0**	**0**	**3**

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

	Semester	**I**
Course Objectives:		
• To understand several Cryptographic algorithms. • To design secure internet Protocols. • To understand role of security protocols in multi hop wireless networks.		
Course Outcomes (CO): Student will be able to		
• Design adversary models and protocols • Design of secure communication protocols in Internet applications. • Analyze cryptographic algorithms • Identify security threats in Mobile Applications. • Design of secure protocols for wireless ad-hoc and sensor networks.		
UNIT - I		Lecture Hrs:9
Cryptographic algorithms, Pseudorandom Generators, Hash functions, Block ciphers, Stream Ciphers, Access Control Methods.		
UNIT - II		Lecture Hrs:9
Message Authentication and Digital Signatures, Design of secure Internet protocols, Key distributions, Design of Access control methods, Network Anomaly Detection methods, Mobile IPv6, https protocol.		
UNIT - III		Lecture Hrs:9
Design of Firewalls and Intrusion Detection Systems, Malware detection methods, Mobile application security models, Mobile threats and malware. Trust based protocols, Mobile app security, Vulnerabilities and Security Challenges in Wireless networks, Trust Assumptions, Adversary models and Protocols		
UNIT – IV		Lecture Hrs:9
Attacks against naming and addressing in the Internet, Security protocols for address resolution and address auto configuration, IP Security (IP Sec) protocol, Key Establishment and Revocation Protocols		
UNIT – V		Lecture Hrs:9
Secure Neighbor Discovery, Secure routing protocols in multi-hop wireless networks, Provable Security for Ad-hoc Network routing protocols, Privacy preserving routing in Ad-hoc Networks, Location privacy in vehicular Ad-hoc networks.		
Textbooks:		
1. John R. Vacca, Computer and Information Security Handbook, Elsevier, 2009 2. L. Buttyan, J. P. Hubaux, Security and Cooperation in Wireless Networks, Cambridge University Press, 2008.		
Reference Books:		
1. W. Trappe, L. C. Washington, Introduction to Cryptography with Coding Theory, Prentice-Hall 2005 2. NoureddineBoudriga, Security of Mobile Communications, Auerbach Publications, Taylor and Francis Group, 2010.		

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	CLOUD COMPUTING	L	T	P	C
21D08102c	(Common to M.Tech CN, SE,)	3	0	0	3
	Semester	I			

Course Objectives:

- Understand the hardware, software concepts and architecture of cloud computing
- Realize the importance of Cloud Virtualization, Abstractions and Enabling Technologies.
- Explore the Programming for Applications on Cloud.
- Apply Map-Reduce concept to applications.

Course Outcomes (CO): Student will be able to

- Explain industry relevance of cloud computing and its intricacies, in terms of various challenges, vulnerabilities, SLAs, virtualization, resource management and scheduling, etc.
- Examine some of the application paradigms, and Illustrate security aspects for building cloud-based applications.
- Conduct a research study pertaining to various issues of cloud computing.
- Demonstrate the working of VM and VMM on any cloud platforms (public/private), and run a software service on that.

UNIT - I — Lecture Hrs:9

Introduction, Cloud Infrastructure
Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Major challenges faced by cloud computing; Cloud Infrastructure: Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Service- and compliance-level agreements, User experience and software licensing. Exercises and problems

UNIT - II — Lecture Hrs:9

Cloud Computing: Application Paradigms
Challenges of cloud computing, Existing Cloud Applications and New Application Opportunities, Workflows: coordination of multiple activities, Coordination based on a state machine model: The ZooKeeper, The MapReduce Programming model, A case study: The Grep TheWeb application, HPC on cloud, Biology research

UNIT - III — Lecture Hrs:9

Cloud Resource Virtualization.
Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization, Hardware support for virtualization, Case Study: Xen a VMM based para virtualization, Optimization of network virtualization, The darker side of virtualization, Exercises and problems.

UNIT - IV — Lecture Hrs:10

Cloud Resource Management and Scheduling
Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers; Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Exercises and problems.

UNIT - V — Lecture Hrs:10

Cloud Security, Cloud Application Development
Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services, Cloud-based simulation of a distributed trust algorithm, A

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trust management service, A cloud service for adaptive data streaming, Exercises and problems. Amazon Simple Notification services.
Textbooks:
1.Cloud Computing Theory and Practice. Dan C Marinescu: Elsevier (MK), 1st Edition, 2013, ISBN: 9780124046276. 2.Distributed Computing and Cloud Computing, from parallel processing to internet of things. Kai Hwang, GeofferyC.Fox, Jack J Dongarra: Elsevier(MK), 1st Edition, 2012, ISBN: 978-0-12-385880-1
Reference Books:
1.Cloud Computing Principles and Paradigms, RajkumarBuyya, James Broberg, AndrzejGoscinski: Willey, 1st Edition, 2014, ISBN: 978-0-470-88799-8. 2.Cloud Computing Implementation, Management and Security, John W Rittinghouse, James F Ransome: CRC Press, 1st Edition, 2013, ISBN: 978-1-4398-0680-7
Online Learning Resources:
OLI Course: http://oli.cmu.edu (accessed through https://blackboard.andrew.cmu.edu) **The Project Zone:**https://TheProject.Zone **Piazza:** http://piazza.com/cmu/spring2016/1531915619/home

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COURSE STRUCTURE

Course Code	DISTRIBUTED AND PARALLEL SYSTEMS	L	T	P	C
21D58204a		3	0	0	3
	Semester	**I**			

Course Objectives:

- To understand the concepts of distributed systems.
- To identify the importance of distributed OS.
- To design distributed algorithms.
- Intricate Resource Security and Protection

Course Outcomes (CO): Student will be able to

- Understand the client-server communication in distributed systems.
- Identify the role of Distributed Operating Systems.
- Understand the concepts of Distributed Resource Management.
- Design synchronous distributed algorithms.
- Describe Resource security and Protection.

UNIT – I	Lecture Hrs:9

Introduction – Examples of Distributed Systems – Resource Sharing and the Web – Challenges- System Models - Introduction – Architectural Models – Functional Models. Characterization of Distributed Systems – Client-Server Communication – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications.

UNIT – II	Lecture Hrs:9

Distributed Operating Systems - Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non-Token Based Algorithms – Lamport's Algorithm - Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols – Classification - Solutions –Applications.

UNIT – III	Lecture Hrs:9

Distributed Resource Management - Distributed File systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols - Design Issues. Distributed Scheduling – Issues – Components – Algorithms.

UNIT – IV	Lecture Hrs:9

Introduction to Distributed Algorithms, Kinds of Distributed Algorithm, Timing Models. Synchronous Network Algorithms: Synchronous Network Model, Leader Election in a synchronous Ring, Algorithms in a General Synchronous Networks, Distributed Consensus with Link Failures, Distributed Consensus with Process failures, More Consensus problems

UNIT – V	Lecture Hrs:9

Resource Security and Protection - Introduction – The Access Matrix Model – Implementation of Access Matrix Model – Safety in the Access Matrix Model – Advanced Models of protection – Data Security.

Textbooks:

1. George Coulouris, Jean Dellimore and Tim KIndberg, "Distributed Systems Concepts and Design", Pearson Education, 4th Edition, 2005 [Unit-I]
2. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems",
3. McGraw-Hill, 2001 [Units II - IV]

Reference Books:

1. Joshy Joseph and Craig Fellenstein, "Grid Computing", IBM Press, 2004. [Unit –V]
2. Ajay D. Kshemkalyani and MukeshSinghal, " Distributed Computing – Principles,

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3. Algorithms and Systems", Cambridge University Press, 2008.
4. Pradeep K. Sinha, Distributed Operating Systems, PHI, 2005.
5. Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann Publishers, 2000.

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COURSE STRUCTURE

Course Code	NETWORK CODING	L	T	P	C
21D08103a		3	0	0	3
	Semester	**I**			

Course Objectives:

- Learn the fundamentals of network coding theory.
- Understand the performance parameters required for network coding.
- Gain the knowledge of the network coding design methods
- Learn different approaches for the network coding.
- Understand error correction and detection methods of adversarial errors.

Course Outcomes (CO): Student will be able to

- Demonstrate knowledge and understanding of the fundamentals of Network Coding Theory.
- Summarize all the performance parameters and resources for network coding.
- Construct the network code for different networks.
- Deal with different approaches of Network Coding in lossy and lossless networks.
- Deal with multiple sources network coding and detect adversarial errors

UNIT - I	Lecture Hrs:9

Introduction- A historical Perspective, Network Coding; Network Coding Benefits: Throughput, Robustness, Complexity, Security; Network Model, Main Theorem of Network Multicast: The Min-Cut Max-flow Theorem, The Main network coding Theorem, Theoretical Framework for Network Coding: A Network Multicast Model, algebraic Framework, Combinatorial Framework, Information-Theoretic Framework, Types of Routing and coding.

UNIT - II	Lecture Hrs:9

Throughput Benefits of Network Coding- Throughput Measures, Linear Programming Approach, Configurations with Large Network Coding Benefits, Configurations with Small Network Coding Benefits, Undirected Graphs, Networks with Delay and Cycles: Dealing with Delay, Optimizing for Delay, Dealing with Cycles. Resources for Network Coding: Bounds on Code Alphabet Size, Bounds on the Number of Coding Points, Coding with Limited Resources.

UNIT - III	Lecture Hrs:

Network Code Design Methods for Multicasting- Common initial procedure, centralized algorithms, decentralized algorithms, scalability to network changes. Single-Source Linear Network Coding-Acyclic Networks, Linear network code, Desirable properties of a linear network code, Existence and construction, Algorithm refinement for multicast. Cyclic NetworksDelay-Free Cyclic Code, Non-equivalence between local and global descriptions, Convolutional network code, decoding of convolutional network code.

UNIT – IV	Lecture Hrs:9

Inter-Session Network Coding- Scalar and vector linear network coding, Fractional coding problem formulation, Insufficiency of linear network coding, Information theoretic approaches, Constructive approaches. Network Coding in Lossy Networks, Random linear network coding, Coding theorems: Unicast connections, Multicast connections, Error exponents for Poisson traffic with i.i.d. losses. Subgraph Selection- Flow-based approaches: Intra-session coding, Computation-constrained coding, Inter-session coding; QueueLength-Based approaches.

UNIT – V	Lecture Hrs:9

Multiple Sources Network Coding- Superposition coding and max-flow bound; Network Codes for Acyclic Networks- Achievable information rate region, Inner bound Rin, Outer bound Rout, RLP – An explicit outer bound. Security against adversarial Errors- Error Correcting bounds for centralized network coding, Distributed random network coding and polynomial-complexity error correction, Detection of adversarial errors: Model and problem formulation, Detection probability.

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Textbooks:
1. Raymond W. Yeung, Shuo-Yen Robert Li, Ning Cai, Zhen Zhang, "Network Coding Theory", Now publishers Inc, 2006, ISBN: 1-933019-24-7. 2. Christina Fragouli, EminaSoljanin, "Network Coding Fundamentals", Now publishers Inc, 2007, ISBN: 978-1-60198-032-8.
Reference Books:
1. Tracey Ho, Desmond Lun, "Network Coding: An Introduction", Cambridge University Press, 2008, ISBN: 978-0-521-87310-9. 2. Muriel Medard, Alex Sprintson, "Network Coding: Fundamentals and Applications", 1st Edition, 2012, Academic Press, Elsevier, ISBN: 978-0-12-380918-6

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COURSE STRUCTURE

Course Code	DESIGN PATTERNS	L	T	P	C
21D58104b	(Common to M.Tech CSE, CN, SE)	3	0	0	3
	Semester	I			

Course Objectives:

- To understand the basic concepts of Design Patterns.
- To implement the document editor process for a considered case study.
- To implement various Structural and Behavioral Patterns.

Course Outcomes (CO): Student will be able to

- Identify basic concepts of Design Patterns.
- Design Document editor for a considered application.
- Analyze the structural Patterns.
- Examine the Behavioral Patterns.

UNIT - I	Lecture Hrs:9
Introduction : What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.	
UNIT - II	Lecture Hrs:9
A Case Study : Designing a Document Editor : Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary. Creational Patterns : Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.	
UNIT - III	Lecture Hrs:9
Structural Pattern Part-I : Adapter, Bridge, Composite. Structural Pattern Part-II : Decorator, Façade, Flyweight, Proxy.	
UNIT - IV	Lecture Hrs:9
Behavioral Patterns Part-I : Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns Part-II : Mediator, Memento, Observer.	
UNIT - V	Lecture Hrs:9
Behavioral Patterns Part-II (cont'd):State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.	

Textbooks:

1. Design Patterns By Erich Gamma, Pearson Education
2. Design Patterns Explained By Alan Shalloway, Pearson Education.

Reference Books:

1. Pattern's in JAVA Vol-I By Mark Grand ,Wiley Dream Tech.
2. Pattern's in JAVA Vol-II By Mark Grand ,Wiley Dream Tech.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand ,Wiley Dream Tech.
4. Head First Design Patterns By Eric Freeman-Oreilly-spd

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	DATA NETWORKS LAB	L	T	P	C
21D08104		0	0	4	2
	Semester	**I**			

Course Objectives:

- Understand the simulation using NCTU/NS.
- Simulate a three nodes point – to – point network with duplex links between them. Simulate the transmission of ping messages over a network topology consisting of nodes and find the number of packets dropped due to congestion.
- Simulate an Ethernet LAN using n nodes.
- Understand the error detecting using cyclic redundancy check (CRC).
- Understand how the distance vector algorithm can be used to find the shortest path.
- The client-Server communication by message queue or FIFO.
- Control congestion using Leaky bucket algorithm**.**

Course Outcomes (CO):

Acquire knowledge of using simulators for different connections.

- Able to do error detection using CRC.
- Able to find the shortest path in the network using distance vector algorithm
- .Able to do inter process communication and encryption and decryption of data will be clear

List of Experiments:

- Simulation-Introduction
- Simulate to Find the Number of Packets Dropped.
- Simulate to Find the Number of Packets Dropped by TCP/UDP
- Simulate to Find the Number of Packets Dropped due to Congestion
- Simulate to Compare Data Rate& Throughput.
- Simulate to Plot Congestion for Different Source/Destination.
- Simulate to Determine the Performance with respect to Transmission of Packets.
- CRC(Cyclic Redundancy Check)
- Distance Vector Routing
- TCP Socket

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COURSE STRUCTURE

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB (Common to M.Tech CSE, CN, SE,AI & ML)	L	T	P	C
21D58105		0	0	4	2
	Semester	I			

Course Objectives:

- Implement linear and non linear data structures.
- Analyze various algorithms based on their time complexity.
- Choose appropriate data structure and algorithm design method for a specific application.
- Identify suitable data structure to solve various computing problems.

Course Outcomes (CO):

- Implement divide and conquer techniques to solve a given problem.
- Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing.
- Perform Stack operations to convert infix expression into post fix expression and evaluate the post fix expression.
- Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms.

List of Experiments:

- To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing).
- To perform various operations i.e., insertions and deletions on AVL trees.
- To perform various operations i.e., insertions and deletions on 2-3 trees.
- To implement operations on binary heap.
- To implement operations on graphs
- To implement Depth First Search for a graph non-recursively.
- To implement Breadth First Search for a graph non-recursively.
- To implement Prim's algorithm to generate a min-cost spanning tree.
- To implement Krushkal's algorithm to generate a min-cost spanning tree.
- To implement Dijkstra's algorithm to find shortest path in the graph.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
21DRM101	(Common to M.Tech CSE, CN, SE,AI & ML)	2	0	0	2
	Semester	I			

Course Objectives:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

Course Outcomes (CO): Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I		Lecture Hrs:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II		Lecture Hrs:

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 - III		Lecture Hrs:

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 - IV		Lecture Hrs:

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

UNIT - V		

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.

Textbooks:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

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1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	NETWORK PROGRAMMING	L	T	P	C
21D08201		3	0	0	3
	Semester	**II**			

Course Objectives:

- Demonstrate advanced knowledge of networking.
- Understand the key protocols which support the Internet.
- Identify several common programming interfaces for network communication.
- Demonstrate advanced knowledge of programming for network communications.
- Recognize the detailed knowledge of the TCP/UDP Sockets.

Course Outcomes (CO): Student will be able to

- Develop applications that communicate with each other using TCP and SCTP.
- Identify the IPv4 and IPv6 compatibility.
- Evaluate socket programming APIs.

UNIT - I	Lecture Hrs:9

Introduction to network application, client/server communication, OSI Model, BSD Networking history, Test Networks and Hosts, Unix Standards, 64-bit architectures, Transport Layer: TCP, UDP and SCTP.

UNIT - II	Lecture Hrs:9

Sockets Introduction – socket address structures, value-result arguments, byte ordering and manipulation functions, address conversion functions, Elementary TCP Sockets – socket, connect, bind, listen, accept , fork and concurrent server design, getcsockname and getpeername functions and TCP Client/Server Example- client/server programming through TCP sockets, Normal startup, termination, POSIX signal handling, Signal handling in server, Crashing, rebooting of server host, shutdown

UNIT - III	Lecture Hrs:9

I/O Multiplexing and Socket Options, Elementary SCTP Sockets- Interface Models, sctp_xx functions, shutdown function, Notifications, SCTP Client/Server Examples – One-to-Many, Head–of-Line Blocking, Controlling number of streams and Termination, IPv4 and IPv6 Interoperability– different interoperability scenarios.

UNIT - IV	Lecture Hrs:9

Daemon Processes, syslogd, daemonizing functions and the inetd super server, Advanced I/O functions- readv, writev, sendmsg and recvmsg, Ancillary data, Advanced polling, Unix domain protocols- socket address structure, functions and communication scenarios, Nonblocking I/O – connect and accept examples.

UNIT - V	Lecture Hrs:10

ioctl operations- socket, file, interface configuration information, ARP cache and routing table operations, Routing sockets- data link socket address structure, reading and writing, sysctl operations, interface name and index functions, Key Management functions – reading, writing, SADB, SA, Dynamically Maintaining SA's, Out-of-Band data, Threads- basic thread functions, TCP echo server using threads, Mutexes and Conditional variables.

Textbooks:

1.UNIX Network Programming ,W. Richard Stevens, Bill Fenner, Andrew M. Rudoff ,Pearson,,Volume 1, Third Edition, 2004

Reference Books:

1.Network Programming in C ,Barry Nance ,PHI,2002
2.Windows Socket Network ,Bob Quinn, Dave,Pearson,2003

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	INTERNET OF THINGS PROTOCOL ENGINEERING	L	T	P	C
21D58202		3	0	0	3
	Semester	II			

Course Objectives:

Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.
- Familiarize the student with application program interfaces for IoT.
- Enable students to create simple IoT applications.

Course Outcomes (CO): Student will be able to
- Choose the sensors and actuators for an IoT application
- Select protocols for a specific IoT application
- Utilize the cloud platform and APIs for IoT applications
- Experiment with embedded boards for creating IoT prototypes
- Design a solution for a given IoT application
- Establish a startup

UNIT - I — Lecture Hrs:

Overview of IoT:
The Internet of Things: An Overview, The Flavor of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?
Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.
Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

UNIT - II — Lecture Hrs:

Embedded Devices:
Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

UNIT - III — Lecture Hrs:

Communication in the IoT:
Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols
Prototyping Online Components:
Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

UNIT - IV — Lecture Hrs:

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups.
Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

UNIT - V — Lecture Hrs:

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software.
Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions

Textbooks:

1.Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. HaiderRaad Fundamentals of IoT and Wearable Technology Design, Wiley Publications2020.
2. KashishAraShakil,Samiya Khan, Internet of Things (IoT) Concepts and Applications,Springer Publications 2020.

Course Code	MEAN STACK DEVELOPMENT	L	T	P	C

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

21D08202a		**3**	**0**	**0**	**3**
	Semester	**II**			

Course Objectives:

- To understand basic concepts of JAVASCRIPT.
- To implement concepts of HTML,CSS, and REACT in developing various websites.
- To design solutions to real world scenarios using NODE and EXPRESS JS.
- To Analyze concepts of MONGODB.
- To implement socket programming in MERN stack.

Course Outcomes (CO): Student will be able to

- Understand basic concepts of JAVASCRIPT.
- Implement concepts of HTML,CSS, and REACT in developing various websites.
- Design solutions to real world scenarios using NODE and EXPRESS JS.
- Analyze concepts of MONGODB.
- Implement socket programming in MERN stack.

UNIT – I	Lecture Hrs:10

Introduction: data types ,logical operations, functions, object and classes, promise async& await, modules and npm packages, error handling, Document Object module,
J Query.

UNIT – II	Lecture Hrs:10

HTML CSS and REACT : Basic structure of a webpage, Different types of tags , HTML text fundamentals, Creating hyperlinks, Insertion of images and multimedia, Introduction CSS, CSS-selector –internal- external , CSS- inline class background font text colour, CSS-padding margin border, Installation of react , REACT- virtual DOM, REACT-JSX, REACT-components, REACT-prop and state , REACT – lifecycles.

UNIT – III	Lecture Hrs:10

Node and Express JS : Introduction of Node JS (Run time environment), Node JS installation, Node JS web based example (import required modules ,create server,read request and return response), Node JS – npm ,errors, crypto, Node JS – child process ,buffer, string, Node JS- string decoder ,query string , Node JS- callbacks , events, web modules, Introduction of APIs, Express JS – introduction , Express JS- installation, Express JS – GET, POST, REQUEST, RESPONSE, Express JS- Routing ,file upload, cookies, middleware .

UNIT – IV	Lecture Hrs:10

MongoDB: Introduction of MongoDB, Difference between SQL and NoSQL, MongoDB data types, MongoDB installation, Data modelling in MongoDB, Create database, Drop Database, Create collection, Insert document, Select document, Queries in MongoDB, Sorting data in document, Remove document.

UNIT - V	Lecture Hrs:10

Socket programming in MERN stack : Connect the react to node by axiom, Import required module, Create server in node, Connect the Node JS to MongoDB, Create request , Read Response, Full Stack Project.

Textbooks:

1. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node Paperback – 1 April 2017 by Vasan Subramanian (Author)
2. Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App by Greg Lim (Author)

Reference Books:

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1. Getting MEAN with MONGO, Express angular and node by Simon Holmes, Dreamtech Publishers.
2. Full Stack JavaScript Development with MEAN by COLIN J Ihrig and Adam J bretz.Sitepoint publishers.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	OPTICAL NETWORKS	L	T	P	C
21D08202b		3	0	0	3
Semester		II			

Course Objectives:

- To learn the basic concepts of optical networks.
- To identify the static and dynamic traffic routing.
- To examine the control and management functions & Protocols.
- To identify the role of next generation optical networks.

Course Outcomes (CO): Student will be able to

- Understand the basic concepts of Optical Networks.
- Discuss static and dynamic Traffic routing in wavelength routed networks.
- Analyze the control and management functions and protocols.
- Identify the importance of Next Generation Optical Networks.

UNIT – I	Lecture Hrs:9

Introduction to optical networks – Principles of optical transmission – Evolution of optical networks – Components and enabling technologies – Wavelength division multiplexing (WDM) – WDM network architectures, broadcast-and-select networks, linear light wave networks, and wavelength routed networks – Issues in broadcast-and- Select networks.

UNIT – II	Lecture Hrs:9

Static traffic routing in wavelength routed networks – Virtual topology design – problem formulation and algorithms - design of multi-fiber networks – Virtual topology reconfiguration – problem formulation - reconfiguration due to traffic changes - reconfiguration for fault restoration – Network provisioning.

UNIT – III	Lecture Hrs:9

Dynamic traffic routing in wavelength routed networks – Routing and wavelength assignment algorithms – Centralized and distributed control – Introduction to Wavelength convertible networks – Wavelength rerouting.

UNIT – IV	Lecture Hrs:9

Control and Management – Functions – Framework – Information Model – Protocols – Optical layer Services and Interfacing – Network Survivability – Protection in SONET/ SDH – Protection in IP Networks – Optical Layer Protection – Schemes.

UNIT - V	Lecture Hrs:9

Next generation optical Internets – burst switching – packet switching (IP-over-WDM) – Multicast traffic routing – source rooted trees - Access Networks – PON, FTTC, FTTH.

Textbooks:

1. B. Mukherjee, "Optical Communication Networks", McGrawHill, 1997 (UNIT I)
2. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical Perspective", 2nd Edition, Morgan Kaufmann (Elsevier Indian Edition), 2004. (Units IV and V)

Reference Books:

1. C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks: Concepts, Design, and Algorithms", PHI, 2002. (Units I, II, III, and V)

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	DESIGN OF SECURE PROTOCOLS	L	T	P	C
21D08202c		3	0	0	3
	Semester	**II**			

Course Objectives:

- To understand Hash ,block and stream ciphers.
- To identify the concepts of Digital Signatures.
- To analyze various types of attacks.
- To intricate use of privacy preserving in adhoc networks.

Course Outcomes (CO): Student will be able to

- Understand Hash ,block and stream ciphers.
- Identify the concepts of Digital Signatures.
- Analyze various types of attacks.
- Intricate use of privacy preserving in adhoc networks.

UNIT – I	Lecture Hrs:8
One-Way Functions, Pseudorandom Generators, Hash functions, Block ciphers, Stream Ciphers, Access Control Methods.	
UNIT – II	Lecture Hrs:8
Message Authentication and Digital Signatures, Vulnerabilities and Security Challenges of Wireless networks, Trust Assumptions, Adversary models and Protocols.	
UNIT – III	Lecture Hrs:9
Attacks against naming and addressing in the Internet, Security protocols for address resolution and address auto configuration, Security for global IP mobility, IP Security (IP Sec) protocol, Key Establishment and Revocation Protocols in Sensor Networks.	
UNIT – IV	Lecture Hrs:9
Secure Neighbor Discovery, Secure routing protocols in multi-hop wireless networks, Provable Security for Ad-hoc Network routing protocols.	
UNIT - V	Lecture Hrs:9
Privacy preserving routing in Ad-hoc Networks, Location privacy in vehicular Ad-hoc networks, Secure protocols for behavior enforcement Game theoretic model of packet forwarding.	

Textbooks:

1. L. Buttyan, J. P. Hubaux, "Security and Cooperation in Wireless Networks", Cambridge University Press, 2008.
2. . O. Goldrich, "Foundation of Cryptography-Vol. 1 and Vol. 2", Cambridge University Press, 2001.

Reference Books:

1. James Kempf, ―Wireless Internet Security: Architecture and Protocols‖, Cambridge University Press, 2008.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
21D08203a		3	0	0	3
	Semester	II			

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes (CO): Student will be able to

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

UNIT - I — Lecture Hrs:10

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT - II — Lecture Hrs:9

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III — Lecture Hrs:10

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV — Lecture Hrs:9

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving andretrieving data using Shared Preference

UNIT - V — Lecture Hrs:9

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXTBOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,2013

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	SOCIAL NETWORK ANALYSIS	L	T	P	C
21D08203b		3	0	0	3
	Semester	**II**			

Course Objectives:

- To inspire the students with interest, excitement, and urge to learn the subject of Social network
- analysis .
- To understand the fundamental concepts of Social network analysis .
- To introduce the purpose of learning important aspects in Social network analysis .

Course Outcomes (CO): Student will be able to

- Explain basic concepts and theories of network analysis in the social sciences, and understand how these concepts and theories can help explain different actors' micro behaviours as wellasmacro outcomes;
- Critically examine the ways in which networks can contribute to the explanation of social, political, economic and cultural phenomena;
- Use statistical software to visualize networks and analyse their properties, connecting these to network concepts and theories;
- Explain principles underlying statistical models for social networks;
- Use software to implement statistical models of social networks to analyse network formation and evolution;
- Use software to simulate the dynamics of networks based on social network models.

UNIT - I	Lecture Hrs:10

Introduction to Web - Limitations of current Web – Development ofSemantic Web – Emergence of the Social Web - Network analysis -Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis -Electronic discussion networks, Blogs and online communities, Web-based networks - Applications of Social Network Analysis

UNIT - II	Lecture Hrs:10

Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation - Ontology languages for the Semantic Web -RDF and OWL - Modeling and aggregating social network data – State-of-the-art in network data representation, Ontological representation of social individuals -Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations

UNIT - III	Lecture Hrs:10

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Definition of Community - Evaluating Communities –Methods for Community Detection & Mining -Applications of Community Mining Algorithms- Tools for Detecting Communities Social Network Infrastructures and Communities-Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions

UNIT - IV	Lecture Hrs:9

Understanding and Predicting Human Behavior for Social Communities - User Data Management, Inference and Distribution- Enabling New Human Experiences - Reality Mining - Context-Awareness - Privacy in Online Social Networks

UNIT - V	Lecture Hrs:9

Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis -Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons - Attack Spectrum and Countermeasures

Textbooks:

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011. 2. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", Springer, first edition, 2011.
Reference Books: 1. Peter Mika, "Social networks and the Semantic Web", Springer, first edition 2007. 2. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, first edition, 2010. 3. Dion Goh and Schubert Foo, "Social information retrieval systems: emerging technologies and applications for searching the Web effectively", IGI Global snippet, 2008. 133 4. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and social information retrieval and access: techniques for improved user modelling", IGI Global snippet, 2004 .
Online Learning Resources:
1. www.utdallas.edu 2. ibook.ics.uci.edu 3. www.ebmtools.org

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	ADVANCED CRYPTOGRAPHY	L	T	P	C
21D08203c		3	0	0	3
	Semester	**II**			

Course Objectives:

Completion of this course will enable the students to:

- Describe network security services and mechanisms.
- Symmetrical and Asymmetrical cryptography.
- Data integrity, Authentication, Digital Signatures.
- Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc

Course Outcomes (CO): Student will be able to

- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.
- Compare various Cryptographic Techniques
- Design Secure applications
- Inject secure coding in the developed applications

UNIT - I	Lecture Hrs:9

Number Theory: Introduction to number theory, Overview of modular arithmetic, discrete logarithms, and primality/factoring, Euclid's algorithm, Finite fields, Prime numbers, Fermat's and Euler's theorem-Testing for primality.

UNIT - II	Lecture Hrs:9

Symmetric & Asymmetric Cryptography: Classical encryption techniques, Block cipher design principles and modes of operation, Data encryption standard, Evaluation criteria for AES, AES cipher, Principles of public key cryptosystems, The RSA algorithm, Key management – Diffie Hellman Key exchange, Elliptic curve arithmetic-Elliptic curve cryptography

UNIT - III	Lecture Hrs:9

Authentication functions: MAC ,Hash function, Security of hash function and MAC,MD5 ,SHA ,HMAC, CMAC , Digital signature and authentication protocols , DSS ,EI Gamal – Schnorr.

UNIT - IV	Lecture Hrs:9

Authentication applications: Kerberos & X.509 Authentication services Internet Firewalls for Trusted System: Roles of Firewalls , Firewall related terminology-,Types of Firewalls ,Firewall designs, Intrusion detection system , Virus and related threats, Countermeasures , Firewalls design principles ,Trusted systems, Practical implementation of cryptography and security.

UNIT - V	Lecture Hrs:9

Quantum Cryptography and Quantum Teleportation: Heisenberg uncertainty principle, polarization states of photons, quantum cryptography using polarized photons, local vs. non local interactions, entanglements, EPR paradox, Bell's theorem, Bell basis, teleportation of a single qubit theory and experiments.

Textbooks:

1.Cryptography and Network Security Principles And Practice ,William Stallings Pearson,Fourth Edition
2.A Course in Number Theory and Cryptology ,NealKoblitz, Springer, 1987

Reference Books:

Cryptography and Network Security Behrouz A Forouzan, DebdeepMukhopadhyay, Mc-GrawHill ,3rd Edition, 2015

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	NETWORK PROGRAMMING LABORATORY	L	T	P	C
21D08204		0	0	4	2
	Semester	II			

Course Objectives:

- To develop programs for client-server applications
- To perform packet sniffing and analyze packets in network traffic.
- To implement error detecting and correcting codes
- To implement network security algorithms

Course Outcomes (CO):

- Develop programs for client-server applications
- Perform packet sniffing and analyze packets in network traffic.
- Implement error detecting and correcting codes
- Implement network security algorithms

List of Experiments:

1. Write a C program to implement daytime client/server program using TCP sockets
2. Write a TCP client/server program in which client sends three numbers to the server in a single message. Server returns sum, difference and product as a result single message. Client program should print the results appropriately.
3. Write a C program that prints the IP layer and TCP layer socket options in a separate file .
Implementation of client server programs for different network applications
4. Study and analysis of the network using Wireshark network protocol analyzer
5. Implementation of topology generation for network simulation
6. Implementation of queuing management
7. Implementation of MAC-layer protocols

References:

1. W. Richard Stevens, UNIX Network Programming, Volume 1, Second Edition: Networking APIs: Sockets and XTI, Prentice Hall, 1998
2. W. Richard Stevens, UNIX Network Programming, Volume 2, Second Edition: Inter-process Communications, Prentice Hall, 1999
3. W. Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, Pearson Education, 2/e

Online learning resources/Virtual labs:

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	**INTERNET OF THINGS PROTOCOL ENGINEERING LAB**	**L**	**T**	**P**	**C**
21D58206		**0**	**0**	**4**	**2**
Semester		**II**			

Course Objectives:

- To Implement various Linux commands using Raspberry Pi.
- To design python programs for performing arithmetic operations.
- To implement character count of a string.

Course Outcomes (CO):

- Implement various Linux commands using Raspberry Pi.
- Design python programs for performing arithmetic operations.
- Implement character count of a string.

List of Experiments:

Following are some of the programs that a student should be able to write and test on an Raspberry Pi, but not limited to this only.

1. Start Raspberry Pi and try various Linix commands in command terminal window:
ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo,
cron, chown, chgrp, ping etc.
2. Run some python programs on Pi like:
Read your name and print Hello message with name
Read two numbers and print their sum, difference, product and division.
Word and character count of a given string
Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard
input
Print a name 'n' times, where name and n are read from standard input, using for and while loops.
Handle Divided by Zero Exception.
Print current time for 10 times with an interval of 10 seconds.
Read a file line by line and print the word count of each line.
3. Light an LED through Python program
4. Get input from two switches and switch on corresponding LEDs
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm)
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. Access an image trhough a Pi web cam.
9. Control a light source using web page.
10. Implement an intruder system that sends an alert to the given email.
11. Get the status of a bulb at a remote place (on the LAN) through web.
12. Get an alarm from a remote area (through LAN) if smoke is detected.

The student should have hands on experience in using various sensors like temperature, humidity,smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

References:

Online learning resources/Virtual labs:

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	CLUSTER COMPUTING	L	T	P	C
21D08301a		3	0	0	3
	Semester	III			

Course Objectives:

- To get introduced to the terminology and concepts of Data center, Grid computing architecture.
- To learn about grid computing tool kits and standards, SOA, OGSA and GT4
- To know about issues in grid data bases.
- To get introduced to cluster computing and also to get exposure of cluster objectives, architecture and applications.

Course Outcomes (CO): Student will be able to

- Ability to grasp the importance of grid and cluster computing in today's network centric world.
- To learn basics of grid computing architecture.
- Ability to understand about grid computing tool kits and SOA.
- Ability to explain several grid computing frameworks and standards.
- Ability to understand grid and data bases.
- Ability to grasp the significance of cluster computing and its architecture.

UNIT – I Lecture Hrs:10

Introduction : The Data Centre, the Grid and the Distributed / High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web Services and Grid Computing, Business Computing and the Grid – a Potential Win – win Situation, e Governance and the Grid. Technologies and Architectures for Grid Computing : Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids, World Wide Grid Computing Activities.

UNIT – II Lecture Hrs:10

Organizations and Projects: Standard Organizations, Organizations Developing Grid Computing Tool Kits, Framework, and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions, Commercial Organizations Building and Using Grid Based Solutions. Web Services and the Service Oriented Architecture (SOA) :History and Background, Service Oriented Architecture, How a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side.

UNIT - III Lecture Hrs:9

OGSA and WSRF: OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification. Globus Toolkit : History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4- Cases, GT4-Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data, Choreography and Coordination, Main Features ofGT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4Containers.

UNIT - IV Lecture Hrs:9

The Grid and the Databases: Issues in Database Integration with the Grid, The Requirements of a Grid-enabled Database, Storage Request Broker (SRB), How to Integrate the databases with the Grid?, The Architecture of OGSA-DAI for Offering Grid Database Services, What is Cluster Computing: Approaches to Parallel Computing, How to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster, What is the Functionality a

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Cluster can Offer? Categories of Clusters Cluster Middleware: An Introduction: Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling.		
UNIT - V		Lecture Hrs:9
Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor Networking, Protocols & I/O for Clusters : Networks and Interconnection/Switching Devices, Design Issues in Interconnection Networking/Switching, Design Architecture-General Principles and Tradeoffs, HiPPI, ATM (Asynchronous Transmission Mode), Myrinet, Memory Channel (MC), Gigabit Ethernet.		
Textbooks: 1. C.S.R.Prabhu – "Grid and Cluster Computing"-PHI(2008)		
Reference Books: 1.Jankiram, "Grid Computing Models : A Research Monograph", TMH (2005)		

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	OPERATING SYSTEM INTERNALS	L	T	P	C
21D58201		3	0	0	3
	Semester	III			

Course Objectives:

- To be able to read and understand sample open source programs and header files.
- To learn how the processes are implemented in linux.
- To understand the implementation of the Linux file system.
- To study Linux memory management data structures and algorithms.
- To acquire the knowledge in the implementation of inter process communication.
- To understand how program execution happens in Linux.

Course Outcomes (CO): Student will be able to

- To explain the functionality of a large software system by reading its source.
- To revise any algorithm present in a system.
- To design a new algorithm to replace an existing one.
- To appropriately modify and use the data structures of the linux kernel for a different software system

UNIT - I — Lecture Hrs:8

Basic Operating System Concepts - Overview of Unix File System - Files - Links - Types - Inodes -Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization - Interprocess Communication - Process Management - Memory Management - Device Drivers.

UNIT - II — Lecture Hrs:8

Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - System Calls - Kernel Threads - Destroying Processes -Termination - Removal.

UNIT - III — Lecture Hrs:9

The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Files systems – Filesystem Type Registration – Filesystem Handling - Namespaces - Mounting – Unmounting - Implementation of VFS System Calls.

UNIT - IV — Lecture Hrs:9

Page frame management -page descriptors - non-uniform memory access - memory zones - reserved page frames - zoned page frame allocator - kernel mappings - buddy system algorithm - page frame cache - zone allocator.

UNIT - V — Lecture Hrs:9

Process Communication - Pipes -Usage - Data Structures - Creating and Destroying a Pipe - Reading From and Writing into a Pipe. Program Execution - Executable Files - Process Credentials - Command-Line Arguments and Shell Environment - Libraries - Program Segments and Process Memory Regions - Execution tracing - Executable Formats - Execution Domains - The exec Functions

Textbooks:

1. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005.
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, ―Structure and Interpretation of Computer Programs‖, Second Edition, Universities Press, 2013.
3. Maurice J. Bach, ―The Design of the Unix Operating System‖ 1 st Edition Pearson Education, 2003.
4. Michael Beck, Harald Bohme, MirkoDziadzka, Ulrich Kunitz, Robert Magnus, Dirk Verworner, ―Linux Kernel Internals‖, 2nd Edition, Addison-Wesley, 1998.
5. Robert Love, ―Linux Kernel Development‖, 3 rd Edition, Addison-Wesley, 2010.

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Reference Books:
1. Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, 4th Edition, Microsoft Press, 2004.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	ARCHITECTURE Of SOFTWARE DEFINED NETWORKS	L	T	P	C
21D08301b		3	0	0	3
Semester		III			

Course Objectives:

- To understand the evolving network requirements.
- To identify concepts of SDN Plane and its functions.
- To understand the SDN Plane Architecture.
- To identify the concepts of NFV.

Course Outcomes (CO): Student will be able to

- Understand the evolving network requirements.
- Identify concepts of SDN Plane and its functions.
- Understand the SDN Plane Architecture.
- Identify the concepts of NFV.

UNIT - I	Lecture Hrs:10

Evolving network requirements-The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.

UNIT - II	Lecture Hrs:8

SDN data plane: Data plane Functions, Data plane protocols, Open flow logical network Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- Open Flow Protocol.

UNIT - III	Lecture Hrs:9

SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- OpenDaylight-REST- Cooperation and Coordination Among Controllers

UNIT - IV	Lecture Hrs:9

SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic- Traffic Engineering Measurement and Monitoring Security- Data Centre Networking- Mobility and Wireless.

UNIT - V	Lecture Hrs:9

Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV,
NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements- NFV Reference Architecture:
NFV Management and Orchestration

Textbooks:

1. William Stallings, “Foundations of Modern Networking”, Pearson Ltd.,2016.
2. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black,Morgan Kaufmann Publications, 2014
3. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013

Reference Books:

1. Larry Peterson , Carmelo Cascone , Bruce Davie: Software-Defined Networks: A Systems Approach, Systems Approach, 2021

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

AUDIT COURSE-I

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
21DAC101a		2	0	0	0
	Semester	I			

Course Objectives: This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO): Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

UNIT - I		Lecture Hrs:10
1Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity		
UNIT - II		Lecture Hrs:10
Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization		
UNIT - III		Lecture Hrs:10
Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.		
UNIT - IV		Lecture Hrs:9
Key skills needed for writing a Title, Abstract, and Introduction		
UNIT - V		Lecture Hrs:9
Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions		

Suggested Reading

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
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

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	DISASTER MANAGEMENT	L	T	P	C
21DAC101b		2	0	0	0
	Semester	**I**			

Course Objectives: This course will enable students:

- Learn to demonstrate 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.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

UNIT - I

Introduction:
Disaster:Definition,FactorsandSignificance;DifferenceBetweenHazardandDisaster;Naturaland Manmade Disasters: Difference, Nature, Types and Magnitude.

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

UNIT - II

Repercussions of Disasters and Hazards:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsandFamines,Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III

Disaster Preparedness and Management:
Preparedness: Monitoring of Phenomena Triggering ADisasteror Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV

Risk Assessment Disaster Risk:
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - V

Disaster Mitigation:
Meaning,ConceptandStrategiesofDisasterMitigation,EmergingTrendsInMitigation.Structural Mitigationand Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading

1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies
2. "'New Royal book

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi.
3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
21DAC101c		2	0	0	0
	Semester	**I**			

Course Objectives: This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancientliterature

Course Outcomes (CO): Student will be able to

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

UNIT - I		
Alphabets in Sanskrit,		
UNIT - II		
Past/Present/Future Tense, Simple Sentences		
UNIT - III		
Order, Introduction of roots		
UNIT - IV		
Technical information about Sanskrit Literature		
UNIT - V		
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics		

Suggested Reading

1.“Abhyaspustakam” –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2.“Teach Yourself Sanskrit” Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3.“India’s Glorious ScientificTradition” Suresh Soni, Ocean books (P) Ltd.,New Delhi

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COURSE STRUCTURE & SYLLABI

AUDIT COURSE-II

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	PEDAGOGY STUDIES	L	T	P	C
21DAC201a		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes (CO): Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials best support effective pedagogy?

UNIT - I

Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories oflearning,Curriculum,Teachereducation.Conceptualframework,Research questions**.** Overview of methodology and Searching.

UNIT - II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT - III

Evidence on theeffectivenessofpedagogicalpractices,Methodologyfortheindepthstage:quality assessmen t of included studies. How can teacher education (curriculumandpracticum) andthescho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of th body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacherandthecommunity.Curriculumandassessment,Barrierstolearning:limitedresourcesand large class sizes

UNIT - V

Researchgapsandfuturedirections: Researchdesign**,**Contexts**,**Pedagogy**,**Teachereducation**,** Curriculum and assessment**,** Dissemination and research impact.

Suggested Reading

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof
3. Curriculum Studies, 36 (3): 361-379.

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COURSE STRUCTURE & SYLLABI

4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	STRESSMANAGEMENT BY YOGA	L	T	P	C
21DAC201b		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

- To achieve overall health of body and mind
- To overcome stres

Course Outcomes (CO): Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT - I		
Definitions of Eight parts of yog.(Ashtanga)		
UNIT - II		
Yam and Niyam.		
UNIT - III		
Do`sand Don't'sin life. i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii) Shaucha,santosh,tapa,swadhyay,ishwarpranidhan		
UNIT - IV		
Asan and Pranayam		
UNIT - V		
i)Variousyogposesand theirbenefitsformind &body ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam		

Suggested Reading

1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur
2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENTSKILLS	L	T	P	C
21DAC201c		2	0	0	0
	Semester	**II**			

Course Objectives: This course will enable students:

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

Course Outcomes (CO): Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geetawilllead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT - I

Neetisatakam- Holistic development of personality
Verses-19,20,21,22(wisdom)
Verses-29,31,32(pride &heroism)
Verses-26,28,63,65(virtue)

UNIT - II

Neetisatakam- Holistic development of personality
Verses-52,53,59(dont's)
Verses-71,73,75,78(do's)

UNIT - III

Approach to day to day work and duties.
ShrimadBhagwadGeeta:Chapter2-Verses41,47,48,
Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,
Chapter18-Verses45,46,48.

UNIT - IV

Statements of basic knowledge.
ShrimadBhagwadGeeta:Chapter2-Verses 56,62,68
Chapter12 -Verses13,14,15,16,17,18
Personality of Rolemodel. Shrimad Bhagwad Geeta:

UNIT - V

Chapter2-Verses 17,Chapter3-Verses36,37,42,
Chapter4-Verses18,38,39
Chapter18– Verses37,38,63

Suggested Reading

1."SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata
2.Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, RashtriyaSanskrit Sansthanam, New Delhi.

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

OPEN ELECTIVE

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	INDUSTRIAL SAFETY	L	T	P	C
21DOE301b	(Common to M.Tech CSE, CN, SE,AI & ML)	3	0	0	3
	Semester	III			

Course Objectives:

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

Course Outcomes (CO): Student will be able to

- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

UNIT - I — Lecture Hrs:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT - II — Lecture Hrs:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT - III — Lecture Hrs:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT - IV — Lecture Hrs:

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT - V — Lecture Hrs:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Textbooks:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:

1.Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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M.TECH. IN COMPUTER NETWORKS
COURSE STRUCTURE

Course Code	**BUSINESS ANALYTICS**	**L**	**T**	**P**	**C**
21DOE301c	**(Common to M.Tech CSE, CN, SE,AI & ML)**	**3**	**0**	**0**	**3**
	Semester	**III**			

Course Objectives:

- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

Course Outcomes (CO): Student will be able to

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT - I	Lecture Hrs:

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

UNIT - II	Lecture Hrs:

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.

UNIT - III	Lecture Hrs:

Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

UNIT - IV	Lecture Hrs:

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

UNIT - V	Lecture Hrs:

Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

Textbooks:

1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

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M.TECH. IN COMPUTER NETWORKS

COURSE STRUCTURE & SYLLABI

Course Code	OPTIMIZATION TECHNIQUES	L	T	P	C
21DOE301f	(Common to M.Tech CSE, CN, SE,AI & ML)	3	0	0	3
	Semester	III			

Course Objectives:

- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Know the basics of different evolutionary algorithms.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

Course Outcomes (CO): Student will be able to

- Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Use classical optimization techniques and numerical methods of optimization.
- Describe the basics of different evolutionary algorithms.
- Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas

UNIT - I — Lecture Hrs:

LINER PROGRAMMING (L.P):
Revised Simplex Method, Duel simplex Method, Sensitivity Analysis
DYNAMIC PROGRAMMING (D.P):
Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.

UNIT - II — Lecture Hrs:

CLASSICAL OPTIMIZATION TECHNIQUES:
Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.
NUMERICAL METHODS FOR OPTIMIZATION:
Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method

UNIT - III — Lecture Hrs:

MODERN METHODS OF OPTIMIZATION:
GENETIC ALGORITHM (GA):
Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation
GENETIC PROGRAMMING (GP):
Principles of genetic programming, terminal sets, functional sets, differences between GA &GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems

UNIT - IV — Lecture Hrs:

INTEGER PROGRAMMING:
Graphical Representation, Gomory's Cutting Plane Method,Balas' Algorithm for Zero–One Programming, Branch-and-Bound Method

UNIT - V — Lecture Hrs:

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS:
Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

Textbooks:

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COURSE STRUCTURE

1. Engineering Optimization (4th Edition) by S.S.Rao, New Age International,
Reference Books:
1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers 2. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers 3. Operations Research by Hillar and Liberman, TMH Publishers 4. Optimal design – JasbirArora, McGraw Hill (International) Publisher