MIT Art, Design and Technology University, Pune

MIT School of Engineering

DETAIL SYLLABUS

FOR

FIRST to SECOND YEAR

M.TECH. (Computer Science and Engineering) - Networks and Security

MTNS

2017-18

FACULTY OF ENGINEERING

(BOARD OF STUDIES IN COMPUTER SCIENCE AND ENGINEERING)

Prof. (Dr.) Rajneeshkaur Sachdeo

Dean Engineering

Office Seal

About program structure

Overall curriculum synopsis (At-a-Glance) LTP mode
Semester wise course work details with credit points
Assessment structure of the program
Detailed program outline with reference books

Follow In

(Minimum Credits to be earned: 76)

Coding for course/ subject: 17MTNS101, Where; **17** = Year of BOS, **MTNS** = Branch Code, **1**= Semester No.,**01 to N** = Sequence No of Subject.

SEMESTER-I

Course Code	Course Name	Hours/week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CA	FE	Total
17MTNS101	Research Methodology	3	0	0	3	40	60	100
17MTNS102	Advanced Mathematics for Computation	3	1	0	4	40	60	100
17MTNS103	Applied Algorithms	3	1	0	4	40	60	100
17MTNS104	Applied Cryptography	3	0	0	3	40	60	100
17MTNS1_ _	Core Elective-I	3	0	0	3	40	60	100
17MTNS111	Laboratory Practice -I	0	0	4	2	40	60**	100
17MTNS121	Technical Seminar-I	0	0	4	2	100	--	100
Total		**15**	**2**	**8**	**21**	**340**	**360**	**700**

Outcome: The students will be able to configure high speed networks and apply appropriate research methodologies to investigate and solve the complex real time problems while maintaining the security of data.

SEMESTER-II

Course Code	Course Name	Hours/week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CA	FE	Total
17MTNS201	Internet Routing Protocols	3	1	0	4	40	60	100
17MTNS202	Cyber Security & Biometrics	3	0	0	3	40	60	100
17MTNS203	Advanced Network Modelling	3	1	0	4	40	60	100
17MTNS204	Wireless and Optical Networks	3	0	0	3	40	60	100
17MTNS2_ _	Core Elective-II	3	0	0	3	40	60	100
17MTNS211	Laboratory Practice - II	0	0	4	2	40	60**	100
17MTNS221	Mini Project	0	0	4	2	100	--	100
Total		**15**	**2**	**8**	**21**	**340**	**360**	**700**

Outcome:

- The students will be able to apply the knowledge of mathematics and develop secure model of network in distributed environment.
- The students will able to apply the knowledge of network programming, security and network management.

****Final Lab exam will be conducted with viva-voce of the respective practical (50 exam +10 viva = 60)**

SEMESTER-III

Course Code	Course Name	Hours/week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CA	FE	Total
17MTNS301	High Performance Networks	3	1	0	4	40	60	100
17MTNS302	Unix Internals	3	0	2	4	40	60	100
17MTNS3_ _	Elective-III	3	1	0	4	40	60	100
17MTNS3_ _	Elective-IV	3	1	0	4	40	60	100
17MTNS321	Technical Seminar-II	0	0	4	2	40	60**	100
17MTNS322	Dissertation Phase-I	0	0	4	2	40	60**	100
Total		**12**	**3**	**10**	**20**	**240**	**360**	**600**

Outcome: The students will be able to develop and analyze algorithms, and implement them using open source platform. The students will be able to learn the current tools and technologies through elective subjects and technical seminars.

****Final Lab exam will be conducted with viva-voce of the respective practical (50 exam +10 viva = 60)**

SEMESTER-IV

Course Code	Course Name	Hours/week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CA	FE	Total
17MTNS421	Dissertation Phase-II	0	0	28	14	100	200	300
Total		**0**	**0**	**28**	**14**	**100**	**200**	**300**

Outcome: The students will be able to enhance the existing systems or devise a new system which will solve our day to day life problems of humans in better way.

LIST OF ELECTIVES

Elective	Course Name	
Elective-I	17MTNS131	Cloud Security
	17MTNS132	Advanced TCP/IP
	17MTNS133	Distributed Systems
Elective-II	17MTNS231	Digital Watermarking
	17MTNS232	Web Technology
	17MTNS233	Network Management System
Elective-III	17MTNS331	Network Programming
	17MTNS332	Discrete Time Signal Processing
	17MTNS333	Mobile Computing
Elective-IV	17MTNS334	Cyber Law & Ethics
	17MTNS335	Next Generation Networks
	17MTNS336	Pervasive Computing
	17MTNS337	Blockchain Technology

Definition of Credit:-

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical (Lab)/week	1 credit

Code	Definition
L	Lecture
T	Tutorial
P	Practical
CA	Continuous Assessment
FE	Final Evaluation

Course/Subject code:

1	7	M	T	N	S	1	0	1
Year of BoS		Bachelors (BT)/ Maters of Technology(MT)/ Integrated M.Tech (MI)		BoS / Program code with/without specialization		Semester 1 - 9 and X - for tenth Semester	01 – 10 --- Theory subjects 11 – 20 --- Practical's 21 – 30 --- Technical Seminar/mini projects/projects 31 – 40 --- Elective with/ without practical's	

Assessment Structure and Passing %

Assessment	Content	Marks	Passing %	Min Marks for Passing
CA (Theory)	Assignments/ Class work / Quizzes / Tests/ Regularity / Punctuality	10 Marks	40%	40
	Mid-term Exam	30 Marks		
FE (Theory)	End term Exam	60 Marks		
CA (Practical)	Lab Assignments/ Tests/ Regularity / Punctuality / Timely submission	40	40%	40
FE (Practical)	External Examination	60 (**50 exam +10 viva = 60**)		

17MTNS101: RESEARCH METHODOLOGY 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

Unit I: Fundamentals of Research (09 hrs)

Introduction-Meaning of Research, Objectives & Motivation, Types of Research & Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Problems Encountered by Researchers in India; **Defining a Research Problem**:- Research problem, Bringing clarity and focus to your research problem, significance of formulating research problem, Considerations in selecting a research problem, Steps in formulating a research problem.

Unit II: Research Design & Sampling (09 hrs)

Meaning, Need and Types of research design, Features of Good Design, Important concepts of research design, Different research designs, Basic Principles of research designs & important experimental designs. **Design of Sample Surveys**: - Sample design, Sampling & Non-sampling errors, Sample Surveys vs. Census Surveys, Types of Sampling Designs, Probability & Non-probability Sampling

Unit III: Measurement And Scaling Techniques (09 hrs)

Measurement in Research, Measurement Scales, Sources of Error in Measurement, Sound Measurement Test, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Multidimensional Scale, Scale Construction Techniques,

Unit IV: Data Collection & Analysis: (09 hrs)

Collection of Primary Data, Observation Method, Interview Method, Experiments & Surveys, Collection of Secondary Data, Selecting appropriate method for Data Collection, Case study method, Data Preparation process, Descriptive statistics, and Sampling & Statistical Inference; Chi-Square Tests, Anova Technique-one way & two way, Latin square design, ANOCOVA, Sign Tests, Wilcoxon Signed Rank Sum Test for single population, Mann Whitney U Test, Run Tests, Linear Regression Analysis.

Unit V: Hypothesis Testing and Report Writing: (09 hrs)

Hypothesis, Hypothesis Testing, Test Statistics & Critical Regions, Critical value & Decision Rules, Procedure for Hypothesis Testing, Hypothesis Testing for Testing Mean, Proportion & Variance, Hypothesis Testing for Difference of Two Mean, two proportions & two Variances, P-Value Approach, Power of the Test, Limitations of the Tests of Hypothesis, Report writing: Meaning, Techniques and Precautions in Interpretation, Significance of Report Writing, Different steps in Report Writing, Report Layout, Types of Reports, Oral presentation, Mechanics & Precautions for Writing Research Reports.

TEXT BOOKS:

1. Research Methodology: Methods and Techniques by C. R. Kothari, New Age International Publishers, ISBN:81-224-1522-9
2. RESEARCH METHODOLOGY a step-by-step guide for beginners by Ranjit Kumar, SAGE Publications Ltd, ISBN 978-1-84920-300-5.

17MTNS101: ADVANCED MATHEMATICS FOR COMPUTATION

3 1 0 4

(Under revision)

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

Unit I Linear Algebra (09 hrs)

Vector spaces: definition, linear independence of vectors, basis, inner product and inner product space, orthogonality, Gram-Schmidt procedure, subspaces, Matrices: coordinate-dependent linear transformations, null and range spaces, Linear algebraic equations: existence and uniqueness of solution, elementary row/column operations, Gauss elimination and Gauss Jordon methods, Echelon form, pivoting, LU decomposition and Cholesky method, Gauss-Seidel and Jacobi iterative methods,

Unit II Probability and Fuzzy Set (09 hrs)

A review of concepts of probability and random variables: Classical, relative frequency and axiomatic definitions of probability, addition rule, conditional probability, multiplication rule, Bays' Theorem.

Discrete and continuous random variables, probability mass and probability density function.

Introduction to fuzzy set, operations of fuzzy set, fuzzy arithmetic and relations, fuzzy relation equation, fuzzy logics.

Unit III Complex Variables (09 hrs)

A review of concept of limit, continuity, differentiability & analytic functions. Cauchy Riemann Equations, Line Integral in the complex plane, Cauchy Integral Theorem & Cauchy Integral Formula & its consequences, Power series & Taylor Series(in brief) ,Zeros & Singularity, Laurent' Series, Residues, Evaluation of Real Integrals

Unit IV Statistics (09 hrs)

Sampling Distributions: Chi-Square, t and F distributions. Estimation: The method of moments and the method of maximum likelihood estimation, confidence intervals for the mean(s) and variance(s) of normal populations. Testing of Hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test, tests of hypotheses on a single sample, two samples

Unit V Transform Calculus (09 hrs)

Concept of Transforms, Laplace Transform(LT) and its existence, Properties of Laplace Transform, Evaluation of LT and inverse LT, Evaluation of integral equations with kernels of convolution type and its Properties, Complex form of Fourier Integral, Introduction to Fourier Transform, Properties of general (complex) Fourier Transform, Concept and properties of Fourier Sine Transform and Fourier Cosine Transform, Evaluation of Fourier Transform, Solution of ordinary differential equation and one dim.

References:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Publications
2. B. Dasgupta, "Applied Mathematical Methods", Pearson Education, 2006
3. George J.Klir & Bo Yuan, "Fuzzy sets and fuzzy logic: theory and applications" Printice Hall of India.
4. Kuldeep Singh "Linear Algebra (step by step)", Oxford University Press.
5. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons
6. B.V.Ramana "Higher Engineering Mathematics",Mc Graw Hill

17MTNS103: APPLIED ALGORITHMS 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

REVIEW OF DESIGN STRATEGIES (09 hrs)

Divide and conquer, Greedy strategy, Dynamic programming, Backtracking, Branch and Bound. Max flow problem , Complexity analysis.

COMPLEXITY THEORY (09 hrs)

P, NP and NP-Complete complexity classes; A few NP-Completeness proofs.

APPROXIMATION ALGORITHMS (09 hrs)

Introduction, vertex Cover Problem, set cover, TSP, Analysis of approximation algorithms

GEOMETRIC ALGORITHMS (09 hrs)

Convex full problem – formulation, solving by Graham scan algorithm, Jarvis march algorithm; closest pair of points – problem formulation, solving by divide & conquer method.

LINEAR PROGRAMMING (09 hrs)

Formulation of Problems as Linear Programs. Duality. Simplex, Interior Point, and Ellipsoid Algorithms.

TEXT BOOKS:

1. Cormen, Leiserson, Rivest, “Introduction to Algorithms”, PHI
2. Bressard, “Fundamentals of Algorithms”, PHI
3. Horowitz, Sahni, “Fundamentals of Computer Algorithm”, Galgotia

REFERENCE BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms" Pearson Education
2. Jon Kleinberg, Evas Tardos, “Algorithm Design”, Pearson Education
3. Algorithms, Kenneth Berman and Jerome Paul, Cenage Learning ISBN-13 978-81-315-0521-2R

17MTNS104: APPLIED CRYPTOGRAPHY 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION AND BASIC CRYPTOGRAPHIC ALGORITHMS (09 hrs)

Introduction to Cryptography, Encryption and Cryptanalysis, Steganography, Vulnerabilities, privacy and Threats, Encryption schemes, Random numbers, Security of encryption methods, Public Key encryption.

CRYPTOGRAPHIC TECHNIQUES AND APPLICATIONS (09 hrs)

DES, RSA, DSA, Key Management, Compromised key handling, digital signatures, digital certificates, Electronic passports and ID cards vs. SDA/DDA/CDA in bank cards, Electronic commerce, SSL/TLS, Forward Security, PGP vs. smart cards. PKI vs. alternatives.

INTERMEDIATE CRYPTOGRAPHIC PROTOCOLS (09 hrs)

SSL Secure Sockets Layer, Timestamping services, Subliminal Channels, Undeniable signatures, Bit commitment, Coin flipping on the telephone, All or nothing disclosure of secrets.

ADVANCED CRYPTOGRAPHIC PROTOCOLS (09 hrs)

Zero Knowledge Proofs, Digital Certified Mail, Elections, Digital Cash

REAL WORLD APPLICATIONS (09 hrs)

Commonly used software, The law and Cryptography, Politics, Financial cryptography, payment systems, crypto currencies, bitcoin, Mobile phone security. RFID systems, access control, user/data authentication.

TEXT BOOKS:

1. Bruce Schneier , “Applied Cryptography: Protocols, Algorithms, and Source Code in C”, Second Edition, John Wiley & Sons, Inc
2. Handbook of Applied Cryptography" by A. Menezes, P. van Oorschot, and S. Vanstone, CRC Press, 5TH Edition, 2001
3. William Stallings, “Cryptography and Network Security”, 6th Edition, Pearson Education.

REFERENCE BOOKS:

1. Mayes, K. and Markantonakis K (Editors) "Smart Cards, Tokens, Security and Applications" Springer 2006.
2. W. Rankl and W. Effing, "Smart Card Handbook" Wiley 2003.
3. Behrouz Forouzan, “Cryptography and Network Security”, Special Indian Edition, Tata Mc Graw Hill
4. Jonathan Katz and Yehuda Lindell. Introduction to Modern Cryptography. Chapman & Hall/Crc Cryptography and Network Security Series, 2007.
5. D. R. Stinson. CRYPTOGRAPHY: Theory and Practice. CRC Press. Third Edition, 2006.

17MTNS111: LABORATORY PRACTICE – I 0 0 4 2

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 30 Hours

- Lab should include the assignments based on subject like cyber security and biometrics, advanced network modelling and elective-II subjects.
- Course instructor should frame the assignments (4 per subject)

Applied Cryptography:

1. Implement packet analyser tool / protocol analyser using Java / Python. (Protocols – IP, TCP, UDP, ICMP, etc).
2. Write a program with standard crypto libraries like OpenSSL, NTL, GMP, and develop efficient and secure implementation of any public key cryptography algorithm in Java.
3. Demonstrate use of Diffie-Hellman for key exchange.
4. Implement AES algorithm using standard Java libraries.
5. Implement blind signature using RSA.

Applied Algorithms:

1. Implement Naive string matching algorithm and test it on the larger dataset of various input file and analyze the time complexity.
2. Implement Rabin Karp string matching algorithm and test it on the larger dataset of various input file and analyze the time complexity.
3. Implement KMP string matching algorithm and test it on the larger dataset of various input file and analyze the time complexity.
4. Implement Naive string matching algorithm using multi-threading and analyze the time complexity for different dataset.

17MTNS121: TECHNICAL SEMINAR-I **0 0 4 2**

CA : 100 Marks FE : 00 Marks No. of Total Lectures = 30 Hours

State-of-the-art topic should be approved by the guide; useful for professional growth in the field of expertise. The presentation should cover motivation, mathematical modelling, data-table discussion and conclusion. The reports should be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory on the seminar guides to maintain a progressive record of the seminar contact of 1 per month per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load); such record of progressive work shall be referred by the examiners during evaluation.

17MTNS201: INTERNET ROUTING DESIGN 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

NETWORKING AND NETWORK ROUTING: AN INTRODUCTION (09 hrs)

Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology, Architecture, Network Management Architecture, Public Switched Telephone Network

ROUTING ALGORITHMS (09 hrs)

Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Comparison of the Bellman–Ford Algorithm and Dijkstra's Algorithm, Shortest Path Computation with Candidate Path Caching, Widest Path Computation with Candidate Path Caching, Widest Path Algorithm, kShortest Paths Algorithm

ROUTER ARCHITECTURE & PROTOCOLS (09 hrs)

Routing Protocol, Routing Algorithm and Routing Information, Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing Protocol, Link Cost. Functions of a Router, Types of Routers, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures.

INTERNET ROUTING (09 hrs)

Routers, Networks, and Routing Information: Some Basics, Static Routes, Routing Information Protocol Version 1 (RIPv1), Routing Information Protocol Version 2 (RIPv2), Interior Gateway Routing Protocol (IGRP), Enhanced Interior Gateway Routing Protocol (EIGRP), Route Redistribution

BORDER GATEWAY PROTOCOL (09 hrs)

A Brief Overview, Basic Terminology, BGP Operations: Message Operations, BGP Timers, BGP Configuration Initialization, Two Faces of BGP: External BGP and Internal BGP, Path Attributes, BGP Decision Process, Internal BGP Scalability, Significance of Route Flap Dampening, BGP Additional Features, Finite State Machine of a BGP Connection

REFERENCE BOOKS:

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking).
2. Network Algorithmic: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking).

17MTNS202: CYBER SECURITY & BIOMETRICS 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

NETWORK AND SECURITY CONCEPTS (09 hrs)

Information assurance - Basic cryptography - DNS - Firewalls - Virtualization, Microsoft windows security principles, creating a managed network, defining the boundaries of trust, implementing the network security function. BIOMETRIC FUNDAMENTALS AND STANDARDS: Definition, Biometrics versus traditional techniques, Characteristics, Key biometric processes: Verification - Identification - Biometric matching, Performance measures in biometric systems, assessing the privacy risks of biometrics - Designing privacy sympathetic biometric systems, Different biometric standards, and Application properties.

ATTACKER TECHNIQUES (09 hrs)

Tunneling and fraud techniques, Threat infrastructure, Exploitation: Techniques to gain a foothold - Misdirection, Reconnaissance and disruption methods, Malicious code: Self-replicating codes - Evading detection and elevating privileges - Stealing information and exploitation, PHYSIOLOGICAL BIOMETRICS: Facial scan, Ear scan, Retina scan, Iris scan, Finger scan, Automated fingerprint identification system, Palm print, Hand vascular geometry analysis, DNA, Dental.

PHYSICAL SECURITY (09 hrs)

Plan, Design for physical protection, Incorporating physical security into the information protection scheme, Physical access control, Implementing the measures to control access, Process evaluation, Case study: Aadhaar – Banking - Credit cards, BEHAVIOURAL BIOMETRICS: Signature scan, Keystroke scan, Voice scan, Gait recognition, Gesture recognition, Video face, Mapping the body technology.

DEFENSE AND ANALYSIS TECHNIQUES (09 hrs)

Memory forensics: Importance - Capabilities - Framework - Dumping physical memory - Installing and using volatility - Finding hidden process - Volatility analyst pack, Honeypots, Malicious code naming and automated analysis system. USER INTERFACES: Biometric interfaces: Human machine interface - BHMI structure, Human side interface: Iris image interface - Hand geometry and fingerprint sensor, Machine side interface: Parallel port - Serial port - Network topologies, Case study: Palm Scanner interface.

INTRUSION DETECTION (09 hrs)

Network vs Host based detection, Anatomy and process, Network based and host based intrusion detection systems: Architecture - Detection engine - Operational concept - Benefits and challenges. DETECTION TECHNOLOGY: Overview, Detection mechanism, Signatures, Traffic analysis, Intrusion detection project lifecycle: Project phases - Resource estimates - Project planning - Acquisition - Deployment phase - Tuning - Deployment issues - Maintenance. BIOMETRIC APPLICATIONS: Categorizing biometric applications, Application areas: Criminal and citizen identification – Surveillance - PC/network access - E-commerce and retail/ATM, Costs to deploy, Issues in deployment, Biometrics in medicine, cancellable biometrics.

TEXT BOOKS:

1. James Graham, Richard Howard and Ryan Olson, "Cyber Security Essentials", CRC Press, USA, 2011.
2. John R Vacca, "Biometric Technologies and Verification Systems", Elsevier, USA, 2007.

REFERENCE BOOKS:

1. Dan Shoemaker and Arthur Conklin, "Cybersecurity: The Essential Body of Knowledge", Cengage Learning, USA, 2012.
2. Edward G Amoroso, "Cyber Security", Silicon Press, USA, 2006.
3. Ankit Fadia and Manu Zacharia, "Network Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection", Thomson Course Technology, USA, 2010.
4. Anil K Jain, Patrick Flynn and Arun A Ross, "Handbook of Biometrics", Springer, USA, 2010.
5. Ruud M. Bolle et al, "Guide to Biometrics", Springer, USA, 2003.
6. David D Zhang, "Automated Biometrics: Technologies and Systems", Kluwer Academic Publishers, New Delhi, 2000.

17MTNS203: ADVANCED NETWORK MODELLING 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION (09 hrs)

Types of Networks. Network design issues. Network design tools, advanced network architectures. Reliable data delivery, Routing and forwarding, resource allocation, Mobility, Networked applications, Data in support of network design, General Principles of Network Design, network characteristics.

DELAY MODELS IN DATA NETWORKS (09 hrs)

Modeling and Performance evaluation. Multiplexing of Traffic on a Communication Link,Queuing Models- Little's Theorem, Probabilistic Form of Little's Theorem, Application of Little's Theorem, Queuing Systems: M/M/1, M/M/2, M/M/m, M/M/∞, M/M/m/m, M/M/m/q, M/M/1/N, D/D/1, M/G/1 System, M/G/1 Queues with Vacations, Reservations and Polling, Priority Queuing.

MODELING NETWORKS AS GRAPHS, PROBLEMS & ALGORITHMS (09 hrs)

Multipoint line topology- CMST, Esau-William's Algorithm, Sharma's Algorithm, Bin Packing algorithms. Terminal Assignment Greedy algorithm and exchange algorithms, Concentrator location-COM, Add, Drop, Relaxation algorithm. Network of queues, Open, closed and semi-open queues, Network node, Kleinrock's Independent approximation.

QUALITY OF SERVICE IN NETWORKS (09 hrs)

Application and QoS, QoS mechanisms, Queue management Algorithms, Feedback, Resource reservations, traffic engineering, Ubiquitous Computing: Applications and Requirements, Smart Devices and Services, Smart Mobiles, Cards and Device Networks.

ADVANCED TOPICS IN COMPUTER NETWORKS (09 hrs)

Wireless and sensor networks, multimedia networking, content distribution networks, computer network simulation, Domain-specific networks, Next generation networks, Cyber physical systems

REFERENCE BOOKS:

1. Kershenbaum A., "Telecommunication Network Design Algorithms", Tata McGraw Hill.
2. Simulation Modeling and analysis, Averill M. Law, W. D. Kelton.
3. Computer Networks, Principles, Technologies and Protocols for network design Natalia Olifer, Victor Olifer, Wiley India.
4. Ubiquitous Computing, Stefan Poslad, WILEY INDIA EDITION.

17MTNS204: WIRELESS AND OPTICAL NETWORKS 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

WIRELESS LAN (09 hrs)

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security – IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX.

MOBILE NETWORK LAYER (09 hrs)

Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

INTRODUCTION TO WIRELESS SENSOR NETWORKS (09 hrs)

Introduction, Node architecture, Challenges of WSNs, Network Topologies, Operating systems and execution environments, Network architecture- Design principles for WSNs, Service interfaces of WSNs, Gateway concepts, Security- Security considerations in wireless sensor networks and Denial-of-service attacks, Case Study-Node level simulators (ns2, ns3, TOSSIM)

OPTICAL NETWORK ARCHITECTURES (09 hrs)

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, TestBeds for Broadcast & Select WDM; Wavelength Routing Architecture.

NETWORK DESIGN AND MANAGEMENT (09 hrs)

Photonic Packet Switching – OTDM, Transmission System Engineering – System model, Power penalty - transmitter,receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety

TEXT BOOKS:

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.
2. Vijay Garg , “Wireless Communications and networking”, First Edition, Elsevier 2007.
3. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007.
4. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000.

REFERENCE BOOKS:

1. Rajiv Ramaswami, “Optical Networks “ , Second Edition, Elsevier , 2004.
2. Govind P. Agrawal, “ Fiber-optic communication systems”, third edition, John Wiley & sons, 2004.
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.
4. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001.

17MTNS211: LABORATORY PRACTICE– II **0 0 4 2**

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 30 Hours

- Lab should include the assignments based on subject like cyber security and biometrics, advanced network modelling and elective-II subjects.
- Course instructor should frame the assignments (4 per subject)

17MTNS221: MINI PROJECT **0 0 4 2**

CA : 100 Marks FE : 00 Marks No. of Total Lectures = 30 Hours

- Mini-project statement should be selected based on the subjects in current semester.
- Topic should highlight/demonstrate current trends and technology.

Guidelines:

1. Students should select a problem which addresses some basic home, office or other real life applications.
2. Students should understand testing of various components.
3. Students should see that final product submitted by them is in working condition
4. Students should submit the report along with the project.

17MTNS301: HIGH PERFORMANCE NETWORKS 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION (09 hrs)

Review of TCP/IP; Multiplexing, Modes of Communication, Switching, Routing. SONET – DWDM – DSL – ISDN –BISDN.

ADVANCED NETWORKS CONCEPTS (09 hrs)

VPN Remote Access VPN, site to site VPN, Tunnelling to PPP, Security in VPN. GMPLS operation, Routing, Tunnelling and use of FEC, Traffic Engineering, and GMPLS based VPN, overlay networksP2P connections.

HIGH SPEED NETWORKS (09 hrs)

Packet-Switching networks and Frame Relay Networks, Asynchronous Transfer Mode (ATM)-Protocol, Architecture, Logical connections, ATM Cells and Services, ATM Adaption Layer.

HIGH SPEED LANs AND TRAFFIC MANAGEMENT (09 hrs)

The Emergence of High-Speed LANs, Ethernet, Fibre Channel, Wireless LANs, Probability and Stochastic Process, Congestion Control – Effects of congestion, congestion and control, traffic management, congestion control in packet-switching networks, Frame relay congestion control.

TRAFFIC MODELLING AND CONGESTION CONTROL IN ATM NETWORKS (09 hrs)

Little's theorem, Need for modelling, Poisson modelling and its failure, Non poisson models, Network performance evaluation. ATM traffic and congestion control, Traffic management framework, Traffic control, ABR and GFR traffic management.

TEXT BOOKS:

1. High-speed networks and internets: performance and quality of service, William Stallings, 2nd edition.
2. Jean Walrand and Pravin variya , " High performance Communication networks", 2nd edition, Harcourt and Morgan Kauffman, London 2000
3. Andrew S. Tanenbaum, "Computer networks", PHI Private limited, new Delhi

REFERENCE BOOKS:

1. J.F. Kurose & K.W. Ross,"Computer Networking A top down approach featuring the internet", Pearson, 2nd edition, 2003.
2. Walrand .J. Varatya, High performance communication network, Morgan Kauffman – Harcourt Asia Pvt. Ltd. 2nd Edition, 2000.
3. Hersent Gurle & petit, "IP Telephony, packet Pored Multimedia communication Systems",Pearson education 2003.

17MTNS302: UNIX INTERNALS 3 0 2 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

UNIX FILE SYSTEM (09 hrs)

Introduction to UNIX file system, file handling utilities, securities and file permissions, process utilities, Disk utilities, networking commands, Introduction to shell scripting, Working with Bourn shell: Shell responsibilities, PIPES and input and output redirection, Shell variables, Shell commands, Control structures, Shell script examples, ext4, IA-64 Architecture: Userlevel Instruction Set Architecture, Runtime and Software Conventions, System Instruction Set Architecture, The Register Stack Engine (RSE). Kernel Entry and Exit: Interuptions, System Calls, Signals, Kernel acces to user memory, Stack unwinding: IA-64 ELF unwind sections The Kernel Unwind Interface, Embedding unwind information in Assembly code, Implementation Aspects.

UNIX PROCESS MANAGEMENT (09 hrs)

Process management and working of signals in Unix - process definition, its relation with its environment through environment variables, command-line arguments; process memeory layout; process creation-fork(), process control - wait(), waitpid(); program loading-exec() family; process termination-exit(), _exit(); non-local goto-setjmp(), longjmp(); signals-signal disposition, reliable and unreliable ways of signals, creation, pending and delivery stages;signal sets-blocking, unblocking; useful signals-SIGINT, SIGKILL, SIGTERM, SIGALRM, alarm(), pause(), ELF64, Linux Tasks, Virtual Memory Management, Address space for Linux Process, Page Tables, Translation Lookahead Buffers, Page Faults, Memory Coherancy, Switching Address spaces.

ADVANCED I/O (09 hrs)

Introduction, Streams and file objects, Standard Input, Standard Output, and Standard Error, Buffering, opening reading & writing in streams, Nonblocking I/O, Record locking, streams, I/O multiplexing, synchronous I/O, readv & writev functions, readn & written functions, Memory mapped I/O.

INTER-PROCESS COMMUNICATION (09 hrs)

Inter Processes communication within the system and their applications in network programming: types of IPC-pipes, FIFOs, Message Queues, Semaphores, Shared memory; pipescharacteristics, creating a pipe, writing and reading from a pipe, popen(), synchronization, process pipe-lining, co-processes; FIFO-names pipe, characteristics, contrast with pipes, opening, reading and writing, non-blocking option; Message Queues-characteristics, contrast with pipes/fifos, concept of key space, identifier, fork(), msgget(), msgsnd(), msgrcv(),msgctl(); semaphores- characteristics, semget(),semop(),semctl(), semadj variable usage; shared memorycharacteristics, fastest IPC, shmget(),shmat(),shmdt(0,shmctl().

MULTITHREADING IN UNIX (09 hrs)

Different models of concurrent server design: Multiplexing, Forking, Multithreading, Preforking, Prethreading, Preforking and Prethreading; Preforking Models; Prethreading Models. To understand remote procedure calls and practice: RPC model; stubs and skeletons; call semantics. Thread Interface, Thread Synchronization, Symetric Multiprocessing: Multiprocesing on Linux, Linux Locking Principles, Multiprocessor support Interface, CPU-specific Data area.

REFERENCE BOOKS:

1. The Design of the Unix Operating System- Maurice J. Bach.
2. Advanced Programming in the UNIX-W. Richard Stevens.
3. Unix Network Programming: Vol-II Inter Process Communications.

17MTNS321: TECHNICAL SEMINAR-II **0 0 4 2**

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 30 Hours

Seminar based on state-of-the art in the selected electives/current trends/innovations/research. The presentation and the report should cover motivation, mathematical modelling, data-table discussion and conclusion. The reports should be prepared using LATEX derivative. To maintain the quality of the seminar work it is mandatory on the seminar guides to maintain a progressive record of the seminar contact hour of 1 hour per month per seminar which shall include the discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table (as additional teaching load); such record of progressive work shall be referred by the examiners during evaluation.

17MTNS322: DISSERTATION PHASE-I **0 0 4 2**

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 30 Hours

Motivation, Problem statement, survey of journal papers related to the problem statement, problem modelling and design using set theory, NP-Hard analysis, SRS, UML, Classes, Signals, Test scenarios and other necessary, problem specific UML, software engineering documents. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conferences . To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact of 1 per week which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student.

17MTNS421: DISSERTATION PHASE-II **0 0 28 14**

CA : 100 Marks FE : 200 Marks No. of Total Lectures = 210 Hours

Selection of Technology, Installations, UML implementations, testing, Results, and performance discussions using data tables per parameter considered for the improvement with existing known algorithms and comparative graphs to support the conclusions drawn. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II/Scopus/SCI/WoS); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conference.

The project report to be prepared with the approval of Guide using appropriate documentation tool (LATEX) with the following points:

- Motivation,
- Problem statement,
- Literature Survey,
- Analysis & Modelling,
- SRS,
- UML Diagrams,
- Test scenarios
- Experimental Results and
- The other necessary, problem specific software engineering documents.

Student should refer standard journal papers such as IEEE, ACM, Springer Elsevier, etc,

Students must have:

- **Paper Publication of the research work in standard journals with the approval of Guide.**
- **Paper Presentation in standard International Conferences with the approval of Guide.**

7MTNS131: CLOUD SECURITY 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

SECURITY CONCERNS, RISK ISSUES AND LEGAL ASPECTS (09 hrs)

Security concerns, assessing risk tolerance, legal and regulatory issues, security requirements for the architecture, security patterns and architectural elements, cloud security architecture, planning key strategies for secure operation.

VIRTUAL MACHINE SECURITY (09 hrs)

Undesirable effects of virtualization, implications of virtualization on security, VMM based threats, security risks posed by shared images, security risks posed by management OS, weakness of Xen, Xoar, Terra- Trusted virtual machine monitor, ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; guest VM vulnerabilities, guest-hopping attack, hypervisor attacks.

DATA SECURITY (09 hrs)

Data encryption-applications and limits, sensitive data categorization, cloud data storage, Data integrity: Provable Data Possession, Proof of Retrievability, public auditing: homomorphic authenticator, random masking, bilinear pairing, merkley hash tree, Trusted computing, data availability: DDoS attack and its types, packet sniffing attack, data storage wiping.

SECURING CLOUD: BEST PRACTICES (09 hrs)

Overview of security controls, limits of security controls, best practices, security monitoring, security criteria for private cloud, selecting cloud service provider- overview of assurance, risks and security criteria.

EVALUATING CLOUD SECURITY (09 hrs)

Existing work on cloud security, checklist for evaluating cloud security- foundational security, business considerations, defense-in-depth, operational security, metrics for checklist.

TEXT BOOKS:

1. J.R. ("Vic") Winkler, “Securing the Cloud” Syngress , 2011.
2. Danc.Marinercus , “Cloud Computing Theory And Practice”, Elsevier, 2013
3. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more”, Jones & Bartlett Student Edition
4. Ronald L. Krutz, Russell Dean Vines, “Cloud Security” 2010.
5. Sultan Aldossary, William Allen, “Data Security, Privacy, Availability and Integrity in Cloud Computing: Issues and Current Solutions”, https://thesai.org/Downloads/Volume7No4/Paper_64-Data_Security_Privacy_Availability_and_Integrity.pdf

REFERENCE BOOKS:

1. Tim Mather, Subra Kumaraswamy, ShahedLatif, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance” O'Reilly Media; 1 edition , 2009
2. Timothy Grance; Wayne Jansen;NIST “Guidelines on Security and Privacy in Public Cloud Computing”, 2011
3. Evelyn Brown NIST “Guide to Security for Full Virtualization Technologies”, 2011.

17MTNS132: ADVANCED TCP/IP **3 0 0 3**

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTERNET PROTOCOL –IV **(09 hrs)**

Introduction, Datagrams, Fragmentation, Maximum transfer unit (mtu), Fields related to fragmentation, Options, Format, Option types, Checksum, Checksum calculation at the sender, checksum calculation at the receiver, Checksum in the IP packet, IP over ATM, ATM WANS, Routing the cells, Security, Security issues, Ipsec, Ip package, The ARP protocol, ATM ARP.

ICMPV4 AND ICMPV6 **(09 hrs)**

ICMPv4: Introduction, Messages, Debugging Tools, ICMP Package, ICMPv6: Introduction, Error Messages, Informational Messages, Neighbor-Discovery Messages, Group Membership Messages.

INTERNET PROTOCOL-VI & MULTICAST ROUTING PROTOCOLS **(09 hrs)**

Introduction, Address Space Allocation, Global Unicast Addresses, Packet Format, Transition From IPV4 To IPV6, Multicast Addresses, IGMP, Multicast Routing, Routing Protocols.

SCTP & NETWORK MANAGEMENT **(09 hrs)**

SCTP Services, SCTP Features, Packet Format, An SCTP Association, State Transition Diagram, Flow Control, Error Control, Congestion Control, Management Components, SMI, MIB, SNMP.

NETWORK & MULTIMEDIA **(09 hrs)**

Introduction, Digitizing Audio and Video, Streaming Stored Audio and Video, Streaming Live Audio/Video, RTP, RTCP, Voice over IP, Quality of Service, Differentiated Services.

REFERENCE BOOKS:

1. TCP/IP Protocol Suit, Behroz Forouzon, MGH Publications
2. James F. Kurose, “COMPUTER NETWORKING”, 6th edition, Pearson Education
3. William Stallings, “DATA AND COMPUTER COMMUNICATIONS”, Eighth Edition, Pearson Education, Inc.
4. A.S.Tanenbaum, “Computer Networks”, 3rd. edition
5. Behrouz A. Forouzan,”DATA COMMUNICATIONS AND NETWORKING”, Second Edition.

17MTNS133: DISTRIBUTED SYSTEMS 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

DISTRIBUTED COMPUTING SYSTEM FUNDAMENTALS (09 hrs)

Introduction to distributed computing systems, Models, Distributed operating system, Design issues of distributed operating system. **Message Passing**: Features of a good message-passing system, Issues in IPC by Message passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling, Group communication.

REMOTE PROCEDURE CALLS (09 hrs)

RPC model. Implementing RPC mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter- Passing Semantics, Call Semantics, Communication protocols for RPCs. Distributed Shared Memory: General Architecture of DSM systems. Design and implementation issues of DSM, Granularity, Structure of Shared Memory Space, Consistency models.

RESOURCE MANAGEMENT (09 hrs)

Features of global scheduling algorithm, Task assignment approach, Load-Balancing and Load-sharing approach. Distributed File Systems: Features of Good DFS, File Models, File-Accessing models, File Service Architecture, File-sharing semantics, File Caching schemes, File replications.

REPLICATION (09 hrs)

Introduction, System Model & Group Communication, Fault Tolerant Services, Transactions with Replicated Data, Case Studies: Gossip Architecture, Bayou, Coda.

PEER-TO-PEER SYSTEMS (09 hrs)

Introduction, Napster & Its Legacy, Peer-to-Peer Middleware, Routing overlays, Case Studies: Pastry, Tapestry.

TEXT BOOKS:

1. Distributed Operating Systems Concepts and Design – P.K. Sinha (PHI).
2. Distributed Systems Concepts & Design by George Coulouris, Jean Dollimore & Tim Kindberg (Pearson Education).

REFERENCE BOOKS:

1. Distributed Systems concepts and Design – G. Coulouris, J. Dollimore & T. Kindberg – (2nd Edition, Addision Wesley).
2. Modern Operating Systems – A. S. Tanenbaum (PHI).
3. Modern Operating Systems – Singhal.

17MTNS231: DIGITAL WATERMARKING AND STEGANOGRAPHY 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

DIGITAL WATERMARKING (09 hrs)

Origin of copyright protection, Protection of intellectual property through technical means, Integrity and authenticity, Rationale, Digital watermarking and cryptography, First generation approaches, beyond the first generation.

WATERMARK SECURITY AND APPLICATIONS (09 hrs)

Usage specific requirements, Copy right protection, Annotation watermarking, Fingerprinting, Automatic playlist generation for rights verification, Multimedia authentication, Watermarking for copy protection, Security requirements, Watermark security and cryptography, Attacks, Exact authentication, Selective authentication, Localization, Restoration.

DIGITAL WATERMARKING FOR STILL IMAGES (09 hrs)

Classification and application requirements, Photographic and photorealistic images, Binary and halftone images. DIGITAL WATERMARKING FOR AUDIO DATA: Requirements and design, Psychoacoustic facts and models, Perceptual audio marking, Algorithms.

DIGITAL WATERMARKING FOR OTHER MEDIA (09 hrs)

Video data, Three dimensional data, Two dimensional geometry data, Formatted text, Music scores.

STEGANOGRAPHY (09 hrs)

Steganography communication, Notation and terminology, Information, Theoretic foundations of steganography, Practical steganographic methods, Minimizing the embedding impact, Steganalysis.

TEXT BOOKS:

1. Ingemar J Cox et al, “Digital Watermarking and Steganography”, Morgan Kaufmann Publishers, New York, 2008.
2. Juergen Seits, “Digital Watermarking for Digital Media”, IDEA Group Publisher, New York, 2005.

REFERENCE BOOKS:

1. Michael Arnold, Martin Schmucker and Stephen D Wolthusen, “Techniques and Applications of Digital Watermarking and Content Protection”, Artech House, London, 2003.
2. Peter Wayner, “Disappearing Cryptography – Information Hiding: Steganography and Watermarking”, Morgan Kaufmann Publishers, New York, 2008.

17MTNS232: WEB TECHNOLOGY **3 0 0 3**

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

WEB ESSENTIALS, HTML & CSS **(09 hrs)**

Web Clients, Introduction to Web Servers-Apache, Nginx, HTTP status codes. Overview to HTML and JavaScript, Introduction to Style sheet, types of style sheets- Inline, External, Embedded CSS, text formatting properties, CSS Border, margin properties, Positioning Use of classes in CSS, color properties, use of & . CSS Versions-CSS3, SCSS. Introduction to Bootstrap 4.

XML and JSON **(09 hrs)**

Introduction & features of XML, XML writing elements, attributes etc. XML with CSS, DSO, XML Namespaces XML DTD, XML Schemas, Writing Simple sheets using XSLT, SAX & DOM Parsers, SOAP. Introduction to JSON, Creating and Parsing JSON, XML Vs JSON.

PHP **(09 hrs)**

Obtaining, Installing & Configuring PHP, Introduction: PHP & web server Architecture Model, Reading Data in Web Pages, PHP Browser-Handling Power, Object-Oriented Programming, File Handling, Working with Databases, Sessions, Cookies, and FTP, Ajax, Exceptional handling, Case study - PHP framework CodeIgnator, Laravel.

NodeJs **(09 hrs)**

Introduction to NodeJS, Installing NodeJS, NodeJS fundamentals, NodeJS modules, HTTP Servers and Clients – A web application, Web servers and Application deployment, Php Vs NodeJs.

PWA **(09 hrs)**

Introduction to Progressive web apps, PWA measuring tools, Understanding the App manifest, Service workers, Caching and Advanced caching of service workers, Indexed DB and dynamic data. Case study of creating a responsive user interfaces with animation and wrap up.

TEXT BOOKS:

1. Jeffrey Jackson, “Web Technology: A Computer Science Perspective”, Pearson Prentice Hall, 2007. ISBN 0-13-185603-0
2. Barasat Ali Syed, “Beginning Node.js”, Apress
3. Dennis Sheppard, “Beginning Progressive Web App Development”, Creating a Native App Experience on the Web.

REFERENCE BOOKS:

1. David Powers, “Beginning CSS3”, Apress.
2. Ajdin Imsirovic, “Bootstrap 4 Cookbook: Solutions to common problems faced in Responsive Web Design”.
3. Matt Lambert, “Learning Bootstrap 4”, Packt Publishing.
4. Ben Smith, “Beginning JSON”, Learn the preferred data format of the web, Apress.
5. Beginning XML Wrox Press
6. Pankaj Sharma, “Introduction To Web Technology”, 2nd Edition, S. K. Kataria & Sons, 2009
7. Complete Ref. PHP

17MTNS233: NETWORK MANAGEMENT SYSTEM 3 0 0 3

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION TO NETWORK MANAGEMENT (09 hrs)

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

SNMP V1 NETWORK MANAGEMENT (09 hrs)

Organization and Information Models: The History of SNMP Management The SNMP Mode, The Organization Model, System Overview, The Information Model. The SNMP Communication Model, Functional model. SNMP Management: SNMP v2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information , The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMP v1.

NETWORK MANAGEMENT TOOLS AND SYSTEMS (09 hrs)

Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial network management Systems, System Management, and Enterprise Management Solutions. Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, WebBased Enterprise Management. WBEM: Windows Management Instrumentation. Java management Extensions, Management of a Storage Area Network: Future Directions.

PERFORMANCE MODELING AND ESTIMATION (09 hrs)

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

QUALITY OF SERVICE IN IP NETWORKS (09 hrs)

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

TEXT BOOKS:

1. Mani Subramanian, "Network Management, Principles and Practice", Second edition, Pearson Education, 2010.
2. William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service – Second edition", Pearson Education, 2002.

REFERENCE BOOKS:

1. Benoit Claise and Ralf Wolter, "Network Management: Accounting and Performance Strategies", Pearson Education, 2008.
2. J. Richard Burke, "Network Management – Concepts and Practice: A Hands-on Approach",

First edition, Pearson Education, rp2011.
3. Stephen B. Morris, "Network Management, MIBs and MPLS", First edition, Pearson Education, 2003.
4. Farrel et al., "Network Management – know it all", Morgan Kaufmann Publishers (an imprint of Elsevier), 2009.
5. Anurag Kumar, D.Manjunath and Joy Kuri, "Communication Networking: An Analytical Approach", Elsevier, 2004.
6. Thomas G. Robertazzi, "Computer Networks and Systems – Queuing Theory and Performance Evaluation", Third edition , Springer, rp2006.
7. Engineering Internet Qos, Sanjay Jha and Mahbub Hassan, Artech House, 2002
8. Gary N. Higginbottom, "Performance Evaluation of Communication Networks", Artech House, 1998.
9. Brijendra Singh, "Network Security and Management", Third edition, PHI 2012.

17MTNS331: NETWORK PROGRAMMING 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION TO NETWORK PROGRAMMING (09 hrs)

OSI model, Overview of UNIX OS - Environment of a UNIX process - Process control – Process relationships Signals – Interprocess Communication, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation,standard internet services, Protocol usage by common internet application.

SOCKETS (09 hrs)

Introduction to Socket Programming –Introduction to Sockets ,Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers.

APPLICATION DEVELOPMENT (09 hrs)

TCP client server : Introduction ,TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

SOCKET OPTIONS, ELEMENTARY UDP SOCKETS (09 hrs)

Socket options – getsocket and setsocket functions – generic socket options , Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

Elementary UDP sockets – UDP echo Serve function, lost diagram , UDP echo Client – Multiplexing TCP and UDP sockets – , summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

ADVANCED SOCKETS (09 hrs)

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input ram.
Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function. IPC & Remote login: Introduction, File and record locking, Pipes, Name spaces, system IPC, Message queues, Semaphores.--- Terminal line disciplines, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3. Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education
4. W. Richard Stevens, S.A Rago, "Programming in the Unix environment", 2nd edition, Pearson, 2005

17MTNS332: DISCRETE TIME SIGNAL PROCESSING 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION TO SYSTEMS AND SIGNALS (09 hrs)

CT systems and DT systems-Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable, Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals.

FOURIER TRANFORM (09 hrs)

Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis – Properties ,DFT ,Circular Convolution, DFT Spectral leakage ,Efficient Computations of DFT, FFT , DIT and DIF FFT Algorithm, Application of DFT.

TIME-VARIANT & TIME-INVARIANT (09 hrs)

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems, Impulse response characterization and convolution sum, Causal signal response to DT LTI systems. Properties of convolution summation, Impulse response of DT LTI system. DT LTI system properties from Impulse response. System analysis from difference equation model

Z-TRANSFORM (09 hrs)

The z-Transform, Convergence of z-Transform, Basic z-Transform, Properties of z-Transform, Inverse z-Transform and Solving difference equation using z-Transform , ZT and FT,ROC ,Pole – Zero Plot.

LINEAR & -DISCRETE TIME SYSTEMS (09 hrs)

Difference Equations-Block diagram representation-Impulse response - Convolution sum-Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems, System Function H(Z), Analysis of DT LTI system in Z-domain, DT system representation in time & Z domain, Relationship between FT & ZT.

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2007.
2. Steven W. Smith, “The Scientist and Engineer's Guide to Digital Signal
3. Processing”,California Technical Publishing, 2nd Edition, PDF ISBN 0-9660176-6-8

REFERENCE BOOKS:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”,
3. Pearson, 2007.
4. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
5. M.J.Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.

17MTNS333: MOBILE COMMUNICATION 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

WIRELESS COMMUNICATION FUNDAMENTALS (09 hrs)

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

TELECOMMUNICATION (09 hrs)

Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT-2000 – Satellite Networks - Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB - DVB.

WIRELESS LAN (09 hrs)

Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – HIPERLAN – Blue Tooth.

MOBILE NETWORK LAYER AND TRANSPORT AND APPLICATION LAYERS (09 hrs)

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics, Traditional TCP – Classical TCP improvements – WAP, WAP 2.0.

SECURITY ISSUES IN MOBILE COMPUTING (09 hrs)

Introduction, Information security, Security techniques and Algorithms, security Protocols, Public Key Infrastructure, Trust, Security Models, Security Frameworks for Mobile Environment.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002
3. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
5. Hazysztof Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

17MTNS334: CYBER LAW & ETHICS 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

COMPUTER AND CYBER FORENSIC BASICS (09 hrs)

Introduction to Computers, Computer History, Software, Hardware, Classification, Computer Input-Output Devices, Windows, DOS Prompt Commands, Basic Computer Terminology, Internet, Networking, Computer Storage, Cell Phone / Mobile Forensics, Computer Ethics and Application Programs, Cyber Forensic Basics- Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Data Recovery, Operating System Software and Basic Terminology.

DATA AND EVIDENCE RECOVERY (09 hrs)

Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files, Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK) etc, Use computer forensics software tools to cross validate findings in computer evidence-related cases.

CYBER CRIMES AND CYBER LAWS (09 hrs)

- Introduction to IT laws & Cyber Crimes – Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security etc.

CYBER FORENSICS INVESTIGATION (09 hrs)

Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.

CYBER SECURITY (09 hrs)

Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cybercrime, Operating System Attacks, Application Attacks, Reverse Engineering & Cracking Techniques and Financial Frauds.

TEXT BOOKS:

1. Digital Evidence& Computer Crime, Eoghan Casey Bs Ma Ac, ELSEVIER-Academic Press,Third Edition, ISBN 13 : 978-0123742681, ISBN 10 : 0123742684.

REFERENCE BOOKS:

1. Guide to Computer Forensics & Investigation, Bill Nelson, Amelia Phillips, christopher Steuart, Cengage Learning, Fourth Edition, ISBN 13 : 978-1435498839, ISBN 10 : 1435498836.
2. Ivan Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India Student Edition, ISBN 978-81-265-0768-9.

17MTNS335: NEXT GENERATION NETWORKS 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION (09 hrs)

Network and Service management for NGN, IMS advantages, Next Generation OSS Architecture – standards important to oss architecture, Information framework, NGN OSS function/ information view reference model, DMTF CIM. WAN's, WAN Technologies and Topologies. Wireless IP LANS, Mobility Networks, Global IP Networks, Global capacity, Globally Resilient IP, Internet – A Network of Networks. Beyond IP

MULTICAST (09 hrs)

Technology overview –MPLS & QoS, MPLS services and components – layer 2 VPN, layer 2 internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN.

NGN MANAGEMENT (09 hrs)

Network Management and Provisioning – Configuration, Accounting, performance, security, case study for MPLS, Future enhancements – Adaptive self-healing networks.

CONTROL AND SIGNALING PROTOCOLS FOR NGN(SIP, DIAMETER) (09 hrs)

NGN security (AAA, identity management) , Service convergence Fixed-Mobile Convergence (FMC) in NGN, IP Multimedia Subsystem (IMS) for NGN

TRANSITION TO NGN AND FUTURE EVOLUTION (09 hrs)

Migration of PSTN networks to NGN , Transition of IP networks to NGN, IPv6, NGN Evolution

TEXT BOOKS:

1. "Next Generation Networks Services, Technologies and Strategies", Neill Wilkinson, Wiley.
2. "Next generation Telecommunication Networks, Services and Management", Thomas Plavyk, Wiley & IEEE Press Publications, 2012.
3. "MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization", Robert Wood, CISCO Press, 2006.
4. "Next Generation Network Services", Robet Wood, Pearson Next Generation Telecommunications Network, Parliament office of Science and Technology (Postnote). Dec 2007, No. 296 Ref. www.parliament.uk

REFERENCE BOOKS:

1. "Next Generation Network Services", Neill Wilkinson, „John Wiley Publications, 2002
2. "Next Generation Telecommunications Network", Parliament office of Science and Technology (Postnote). Dec 2007, No. 296 Ref. www.parliament.uk
3. "Mobile Next Generation Networks Huber", JF IEEE Multimedia Vol. 11, Issue I Jan- March 2004. Next Generation Telecommunications Networks, Services, and Management by Thomas Plevyak, VeliSahin, ISBN: 978-0-470-57528-4 , Wiley-IEEE Press

17MTNS336: PERVASIVE COMPUTING 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

TOOLS AND TECHNIQUES FOR DYNAMIC RECONFIGURATION AND INTEROPERABILITY OF PERVASIVE SYSTEMS (09 hrs)

Pervasive Computing and Its Significance Research Trends in Pervasive Computing and Networking, Mobile Agent Technology: Introduction, Mobile Agent Security, Mobile Agent Platforms, Sensor Networks : Introduction, Sensor Network Applications, Dynamic Reconfiguration of Sensor Networks, Collaboration and Interoperability Among Sensor Networks, Applications : A Pervasive System for Volcano Monitoring, A Pervasive Computing Platform for Individualized Higher Education

PERVASIVE LEARNING TOOLS AND TECHNOLOGIES (09 hrs)

Introduction, Pervasive Learning: A Promising Innovative Paradigm, Historical Development of Computing and IT in Education, Past Experience and Issues, Practice and Challenge at Waseda E-School, Emerging Technologies and Systems for Pervasive Learning: Emerging Computing Paradigms for Education, Pervasive Learning Support Systems and Technologies, Integration of Real-World Practice and Experience with Pervasive Learning: Ubiquitous Learning, UPS (Ubiquitous Personal Study), Nature of Pervasive Learning and Provision of Well-Being in Education: Ubiquitous and Pervasive, The Possible Trend of Pervasive Technology in Education

SERVICE MANAGEMENT IN PERVASIVE COMPUTING ENVIRONMENTS (09 hrs)

Introduction, Service Management in Pervasive Computing Environments: Introduction, Pervasive Computing Environments, Service Management Framework, General Components of a Service Management System, System Support Components, Service Management Challenges, Techniques for Service Management in PvCE: Introduction, Classification of Service Discovery Protocols, Service Discovery in Infrastructure-Based Networks, Service Discovery in Infrastructure-Less Networks, Multiprotocol Service Discovery, Service Discovery Approaches, Service Composition: Service Composition Functions, Survey of Methods in Service Composition Process, Service Composition Approaches

WEARABLE COMPUTING AND SENSOR SYSTEMS FOR HEALTHCARE (09 hrs)

Introduction, The Health Body Area Network, Medical and Technological Requirements of Health Sensors, Wearable Sensors for Vital Signals Monitoring, Wearable Sensors for Activity Recognition, Sensors and Signals for Emotion Recognition, Intra-BAN Communications in Pervasive Healthcare Systems: Standards and Protocols: IEEE 802.15.4 and ZigBee, Bluetooth, Bluetooth Low Energy, Integrated and Additional Solutions for Health BAN Communications

STANDARDS & IMPLEMENTATION OF PERVASIVE COMPUTING APPLICATIONS (09 hrs)

Introduction: Pervasiveness and Mobility in Computing and Communications, Context Awareness, Heterogeneity, Wireless Technologies and Standards: A Simple Classification of Wireless Networks, Concluding Remarks, Middleware: Future Trends: Beyond the Middleware, Case Studies: Pervasive Computing in Extreme Areas; The Hiker's Personal Digital Assistant, Pervasive Computing in Personal Health Systems; The MyHealthService Approach

TEXT BOOKS:

1. Mohammad S. Obaidat, Mieso Denko And Isaac Woungang, "Pervasive Computing And Networking", Wiley Publication.

17MTNS337: BLOCKCHAIN TECHNOLOGY 3 1 0 4

CA : 40 Marks FE : 60 Marks No. of Total Lectures = 45 Hours

INTRODUCTION TO CRYPTOGRAPHY AND CRYPTOCURRENCY (09 hrs)

What is blockchain, Digital Signatures, Public Keys as Identities, How blockchain works, What is cryptocurrency, Advantages and disadvantages of cryptocurrency.

HOW BITCOIN ACHIEVES DECENTRALIZATION (09 hrs)

Centralization vs. Decentralization, Distributed Consensus, Consensus without Identity: the Block Chain, Incentives and Proof of Work

MECHANICS OF BITCOIN (09 hrs)

Bitcoin Transactions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network, Limitations & Improvements, How to Store and Use Bitcoins

BITCOIN MINING (09 hrs)

The Task of Bitcoin Miners,Mining Hardware,Energy Consumption & Ecology,Mining Pools,Mining Incentives and Strategies, Bitcoin and Anonymity, Alternative Mining Puzzles

COMMUNITY, POLITICS, AND REGULATION (09 hrs)

Consensus in Bitcoin,Bitcoin Core Software,Stakeholders: Who's in Charge?,Roots of Bitcoin,Governments Notice Bitcoin,Anti Money-Laundering,Regulation, Altcoins and the Cryptocurrency Ecosystem, Bitcoin as a platform, Future of Bitcoin.

TEXT BOOKS:

Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller

Blockchain Technology: Introduction to Blockchain Technology and its impact on Business Ecosystem by Mr. Stephen Fleming.