# Course Structure and Syllabus

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. TECH IN COMPUTER AND COMMUNICATION ENGINEERING.**

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

## I Semester

<table>
<thead>
<tr>
<th>Category</th>
<th>Course Title</th>
<th>Int. marks</th>
<th>Ext. marks</th>
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<td>PC-2</td>
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Laboratory I: Wireless Communications and Networks Lab

Seminar I: Seminar - I

**Total**

275 525 21 0 6 25

## II Semester

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Laboratory II: Advanced Communications and Networks Lab

Seminar II: Seminar - II

**Total**

275 525 21 0 6 25
### III Semester

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### IV Semester

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

*For Project review I, please refer 7.10 in R17 Academic Regulations.*
UNIT – I
Coding for Reliable Digital Transmission and storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II
Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III
Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV
Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V
Space-Time Codes: Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti’s schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS:

REFERENCE BOOKS:
1. Bernard Sklar, “Digital Communications-Fundamental and Application”, PE.
3. Salvatore Gravano, ”Introduction to Error Control Codes”, Oxford
UNIT- I
Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT- II
Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT - III
Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT- IV
Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm.
Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT – V
Intruders, Viruses and Worms: Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT - I

**Spread Spectrum Communications:** Spreading sequences- Properties of Spreading Sequences, Pseudo-noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal Variable Spreading Factor Sequences, Barker Sequence, and Complementary Codes.


UNIT - II

**Orthogonal Frequency Division Multiplexing:** Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Window in OFDM Signal and Spectrum, Synchronization in OFDM, Pilot Insert in OFDM Transmission and Channel Estimation, Amplitude Limitations in OFDM, FFT Point Selection Constraints in OFDM, CDMA vs OFDM, Hybrid OFDM.

UNIT - III

**MIMO Systems:** Introduction, Space Diversity and System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond, MIMO-OFDM

UNIT - IV

**Wireless LANs/IEEE 802.11x:** Introduction to IEEE802.11x Technologies, Evolution of wireless LANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing Wireless Technologies, Typical WLAN Hardware

UNIT - V

**Wireless PANs/IEEE 802.15x:** Introduction to IEEE 802.15x Technologies, Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards

**Broad Band Wireless MANs/IEEE 802.16x:** Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical Layer Details, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.

**TEXT BOOKS:**

REFERENCES:
2. Gottapu Sasibhusan Rao, "Mobile Cellular Communication", PEARSON
UNIT – I

UNIT – II

UNIT – III
ATM: Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols.

UNIT – IV
ATM switching: ATM switching building blocks, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, Performance aspects of buffering switching networks.

UNIT – V
ATM Traffic and congestion Control: Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories, Traffic and Congestion Control Framework, Traffic Control, Congestion Control

TEXT BOOKS:
ADHOC WIRELESS NETWORKS (PE - 3)

UNIT - I
Wireless Local Area Networks: Introduction, wireless LAN Topologies, Wireless LAN Requirements, Physical Layer- Infrared Physical Layer, Microwave based Physical Layer Alternatives, Medium Access Control Layer- HIPERLAN 1 Sublayer, IEEE 802.11 MAC Sublayer and Latest Developments-802.11a, 802.11b, 802.11g

UNIT - II

UNIT - III

UNIT – IV

UNIT – V

TEXT BOOKS:

REFERENCE BOOKS:
UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Wireless PANs: Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT – V
The IEEE 802.15 working Group for WPANs: The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT - I
Optical Fibers: Structures, waveguiding and Fabrication- Nature of Light, Basic optical laws and definitions, Single mode fibers, Graded index fiber structure, Attenuation, Signal Dispersion in fibers.
Optical Sources - LEDs, Laser Diodes, Line Coding.

UNIT - II

UNIT - III
Digital Links: Point to point links, power penalties, error control, Coherent detection, Differential Quadrature Phase Shift Keying.
Analog Links: Carrier to noise ration, Multichannel Transmission Techniques, RF over Fiber, Radio over fiber links, Microwave Photonics.

UNIT - IV

UNIT - V
Performance Measurement and Monitoring: Measurement standards, Basic Test Equipment, Optical power measurement, Optical fiber characterization, Eye diagram tests, optical time domain reflectometer, optical performance monitoring, optical fiber system performance measurements.

TEXTBOOK:
UNIT – I


UNIT – II
Basic Architectural Framework: Physical Layer, Basic Components, Source Encoding, Channel Encoding, Modulation.


UNIT – III
Network Layer: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols

Node and Network Management: Power Management, Local Power Management aspects, Dynamic Power Management, Conceptual Architecture

UNIT – IV

Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, Event-Driven Localization

UNIT – V

TEXT BOOKS:

REFERENCES:
UNIT - I

UNIT - II
Blocking Probability: Trunked Channel Systems, Offered Traffic Load, Units of Traffic Load, Trunk Utilization Factor, Erlang B System, Erlang C System.

UNIT - III
IP QoS Generic Functional Requirements: Introduction, Packet Marking, Packet Classification, Traffic Policing, Traffic Rates, Line Rate, Peak Information Rate (PIR) Committed Information Rate (CIR), Burst Sizes, Traffic Metering And Coloring, Single Rate Three Color Marker (SRTCM), Two Rate Three Color Marker (TRTCM), Active Queue Management, Tail Drop Method And TCP Global Synchronization
Random Early Discarding (RED), Weighted Random Early Discarding (WRED), Explicit Congestion Notification (ECN), General Concept, ECN Marking in the IP Header, ECN Marking in The TCP Header, ECN Handshaking And Operation.
Packet Scheduling: FIFO, Priority Queuing (PQ), Fair Queuing (FQ), Weighted Round Robin (WRR), Weighted Fair Queuing (WFQ), Class-Based WFQ (CB WFQ), Traffic Shaping, Pure Traffic Shaper, Token Bucket Traffic Shaper.

UNIT - IV
IP Integrated Services And Differentiated Services:
Differentiated Services: Diffserv Overview, Diffserv Architecture Diffserv Packet Marking, Packet Marking In Conventional Routers, Diffserv (DS) Field Diffserv Code Points (DSCP’s) Per-Hop Behaviors (PHB’s) Expedited Forwarding (EF) Phb Assured Forwarding (AF) PHB.

UNIT - V
QoS in ATM Networks: Genesis of ATM, ATM Network Interfaces, ATM Protocols ATM Cell Layer, ATM Adaptation Layer (AAL), ATM Virtual Connections, Virtual Channel and Virtual Path, Virtual Links Virtual Connections Virtual Path connection (VPC) Virtual Channel Connection (VC), Permanent Virtual Connection (PVC), Switched Virtual Connection (SVC), ATM QoS Parameters, Information Transfer Performance, End-To-End Performance, Performance Management Information Base (MIB),
ATM Service Categories, ATM Service Categories, Traffic Descriptors, AAL Types, ATM Connection Admission Control, A Model of ATM Switch, Logical Port Bandwidth Allocation, CAC For CBR Traffic, CAC For VBR Traffic


**TEXT BOOKS**:

**REFERENCES**:
ADVANCED COMMUNICATIONS AND NETWORKS LAB

Note:
- Minimum of 10 Experiments have to be conducted
- All the Experiments may be Conducted using Network Simulation software like NS-2/ NSG-2.1/ Wire SHARK/ SDR etc.

Note: For Experiments 1 to 7 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Evaluate the performance of various LAN Topologies
2. Evaluate the performance of Drop Tail and RED queue management schemes
3. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
4. Evaluate the performance of TCP and UDP Protocols
5. Evaluate the performance of TCP, New Reno and Vegas
6. Evaluate the performance of AODV, DSR and DSDV routing protocols
7. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
8. Capturing and Analysis of TCP and IP Packets
9. Simulation and Analysis of ICMP and IGMP Packets
10. Analyze the Protocols SCTP, ARP, NetBIOS, IPX VINES
11. Analysis of HTTP, DNS and DHCP Protocols
12. Analysis of OFDM Spectrum
13. Analysis CDMA Downlink