AISECT UNIVERSITY

A STATUTORY UNIVERSITY UNDER SECTION 2(f) OF THE UGC ACT

SCHEME OF EXAMINATION
&
DETAILED SYLLABUS

MASTER OF TECHNOLOGY (EC)
M. Tech (EC)

Wireless & Mobile Communication

2016-2017

Bhopal-Chiklod Road, Near Bangrasia Chouraha,
Vill-Mendua, Distt-Raisen(Madhya Pradesh), Ph:07480-295707
e-mail-info@aisectuniversity.ac.inwebsite: www.aisectuniversity.ac.in

PROGRAMME OBJECTIVES

The Programme Educational Objectives of M. Tech programmes are:

1. To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms
2. To prepare graduates who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise
3. To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, research, design and implementation skills
4. To prepare graduates who will thrive to pursue life-long reflective learning to fulfill their goals

PROGRAMME OUTCOMES

Engineering programmes have been designed to prepare graduates for attaining the following program outcomes:

1. an ability to apply knowledge of mathematics, science and engineering in practice
2. an ability to identify, critically analyze, formulate and solve engineering problems with comprehensive knowledge in the area of specialization
3. an ability to select modern engineering tools and techniques and use them with dexterity
4. an ability to design a system and process to meet desired needs within realistic constraints such as health, safety, security and manufacturability
5. an ability to contribute by research and innovation to solve engineering problems
6. an ability to devise and conduct experiments, interpret data and provide well informed conclusions
7. an ability to understand the impact of engineering solutions in a contemporary, global, economical, environmental, and societal context for sustainable development
8. an ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude
9. an ability to communicate effectively
10. an ability to appreciate the importance of goal setting and to recognize the need for life-long reflective learning

PROGRAMME SPECIFIC OBJECTIVES

1. To provide an overview of Wireless Communication networks area and its applications in communication engineering.
2. To appreciate the contribution of Wireless Communication networks to overall technological growth.
3. To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
4. Understanding of the main concepts and techniques used in the analysis and design of digital communication systems.
5. To know fundamental mechanism of Radio propagation Advancement in Remote Sensing.
6. An understanding of how securely data can be transmitted from one place to remotely place using various protocols.
7. To understand the fundamental concepts of radiation mechanisms. To understand how to measure various antenna parameters.
8. Provide knowledge of Digital Wireless Communications System modeling and design

9. Provide knowledge of system architecture and top down process of designing .This includes transmitter architecture, channel and receiver architecture
10. Provide knowledge of pulse shaping filtering (Square-root raised cosine) & design, D/A and RF up-conversion methods & Design.
11. Provide knowledge of channel coding, spreading, de spreading, de interleaving, and decoding
12. Provide knowledge of s Simulation techniques for performance simulation, Baseband filtering , calibration of noise variance, energy per Symbol, SNR.
13. Provide knowledge of design trade off as simulation of a diversity reception system over time - varying Rayleigh fading channels

PROGRAMME SPECIFIC OUTCOMES

1. To understand the basics of Wireless Communication Networks.
2. To motivate the students to pursue research in the area of wireless communication.
3. Analyze various protocols used in data communication
4. Design networking structure in data communication.
5. Transmit data securely from one place to another.
6. Analyze the performance of various protocols.
7. Learn to represent real world signals in digital format to representation of the signals;
8. Learn to apply the knowledge for proper data recovery.
9. Learn the basic blocks of communication systems.
10. Analyze various protocols used in broadband communication.
11. Design networking structure in broadband communication.

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 101	Advance Communication &Next Generation Networks	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective

1. To understand the communication system techniques from end-to-end, i.e., from sampling to switching.
2. To know the basic parameters that determines the noise performance of a receiver.
3. To know the basic structure of various error control coding techniques.
4. To understand the various transmission and switching techniques and their limitations.

Unit 1: Transmission Media & Systems: Microwave Radio Communication and Systems, Satellite Orbits, Classifications, Models and Parameters, Optical Fiber Transmission Media, Fiber types, Configurations, Classifications, Losses in OFCs, VSAT Systems: Overview, Network Architectures, Access Control Protocols, Basic Techniques, System Design Procedures.

Unit 2: Requirement of Wireless Services & Applications: The First systems, GSM and worldwide cellular revolution, New wireless systems and the burst of the bubble, Types of Services, Requirements of the services, Technical Challenges of Wireless Communication, Noise and Interference Limited Systems.

Unit 3: Switching Techniques: Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks ,n- Stage Networks. Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching ,n- Stage Combination Switching.

Unit 4: Telephone Networks: Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular Mobile Telephony Signaling: Customer Line Signaling, Audio Frequency Junctions and Trunk Circuits, FDM Carrier Systems, PCM Signaling, Inter-Register Signaling, Common-Channel Signaling Principles, CCITT Signaling System no.6,CCITT Signaling System no.7,Digital Customer Line Signaling.

Unit 5: Packet Switching: Statistical Multiplexing, Local-Area and Wide-Area Networks, Large-scale Networks, Broadband Networks. **Switching Networks**: Single-Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems,

Use of Expansion, Call Packing, Rearrange able Networks, Strict-Sensenon blocking Networks, Sectionalized Switching Networks, Next Generation Networks

Course Outcome

1. To acquire skills to design waveform coding techniques and implement the same.
2. To acquire skills to design the various error control coding schemes and carry out their implementations.
3. To design transmission and switching systems to meet out the required blocking probability.
4. To design a receiver to meet out the required Noise performance
5. Ability to carry out Link Budget Calculations for the design of communication system

REFERENCE BOOKS:

1. Advanced Electronic Communication Systems-Wayne Tomasi, 6th Edition,2013,PHI.
2. Satellite Communication-Pratt, Bostian, Allnutt, 2nd Edition,2013,WILEY.
3. Wireless Communication-Andreas F. Molisch,2ndEdition,2014,WILEY.
4. Data Communication & Networking- B.A. Forouzan, 3rdEdition, 2004,TMH.
5. Telecommunication System Engineering–RogerL.Freeman,4thEd.,Wiley-InterScience, John Wiley & Sons, 2004.
6. Telecommunication Switching Systems and Networks-ThiagarajanViswanathan,2000,PHI.
7. Telecommunications Switching, Traffic and Networks-J.E.Flood,2006,Pearson Education.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC-102	Probability & Stochastic Processes	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective

To teach the students for applying probability and stochastic process techniques in design and analysis of communication systems.

Unit1:Random Variables and their Probability Distributions

Random variables, Probability distribution function, Probability density function, Conditional probability, Statistical Independence, Bayes formula.

Moments of random variables: Expected value and moments, Mean and variance of random variable ,Coefficients of variation , Skewness and kurtosis ,Moments ,Covariance and Correlation coefficient, Mean and variance of sum and Product of two random variables .Conditional mean and variance, Application of conditional mean and variance.

Unit2: Discrete Random Variables and their Distributions

Moment Generation Function, Characteristics Function, Cumulants, Probability generating function, Binomial Distribution, Negative Binomial Distribution, Hypergeometric distribution, Multinomial, Poisson Distributions, Relationship between various Discrete-Type distributions

Unit3:Continuous Random Variables and their Distributions

Normal,Log Normal,MultivariateNormal,Gamma,Exponential,Chisquare,Weibull,Rayleigh distributions .Relationship between continuous distributions.

Unit4: Transformation of Random Variables

Transformation of Single, SeveralRandom Variables, Function of Random Variables, Sum, Differences, Product and Ratio of Two Random Variables, Transformation through characteristic Functions.

Unit5: Stochastic Processes

Introduction- Classification of stochastic process, Stationary process (SSS and WSS) Stationary process, Ergodic Process, Independent increment Process, Markov Process, Counting Process, Narrow-Band Process, Normal Process, Wiener-Levy Process, Poisson, Bernoulli, Shot noise Process, Autocorrelation Function.

Course Outcome

The students will able to apply the concepts of probability and stochastic process for analyzing the performance of communication systems.

REFERENCE BOOKS

1. Applied Probability and Stochastic Processes – Michel K. Ochi, JohnWiley&Sons,ISSN–0271-6356, 2008

2 Probability, Random variables and Stochastic Processes -. Paboulis, A, McGraw Hill. New York

3. Probability and Statistics with Reliability, Queuing and Computer Science Application – Kishor S. Trivedi, JohnWiley,2002.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC-103	Radio Wave Propagation & Modelling	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective

To learn the antenna radiation concepts, different types of antenna and its design methodology.

Unit 1: Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, FreeSpace Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection(Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife edge Diffraction, Scattering, Outdoor Propagation Models-Longley- Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfischand Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses(Same Floor), Partition losses between Floors, Log- distance path loss model, Ericsson Multiple Break point Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

Unit 2: Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagation- Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Band width and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multi path Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

Unit 3: Multiple Access Techniques & Speech Coding: FDMA, TDMA, Packet Radio: ALOHA, CSMA, Packet Reservation Multiple Access, Comparison of the methods, Routing for Packet Radio, Duplexing, **Speech Coding:** Source coding basics, Speech Coder designs, speech production, Speech Acoustics, Speech Perception, Stochastic Models for Speech, Quantization and Coding, From speech Transmission to acoustic Telepresence.

Unit 4: Antennas: Introduction, **Antennas for Mobile Stations**: Monopole & Dipole, Helical, Microstrip Planar Inverted F Antenna, Radiation Coupled Dual L Antenna, Multiband Antennas, Antenna Mounting on the Mobile Station **Antenna for Base stations:** Types of Antennas, Array Antennas, Modifying the Antenna Pattern, Impact of the Environment on Antenna Pattern.

Unit 5: Cellular Concepts: System Design Fundamentals: Frequency reuse, Channel assignment, Handoff Strategies, Interference and System capacity, Trunking and grade of service, Improving coverage and capacity in cellular system.

Course Outcome

Students able to design different types of antenna.

REFERENCE BOOKS:

1. Wireless Communication-Andreas F. Molisch,2nd Edition,2014,WILEY.
2. Wireless Communications, Principles, Practice–Theodore, S. Rappaport,2ndEd.,2002,PHI
3. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press

---

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC-1101	Elective I	4(3+1+0)	50	20	30	-	-	100	3 hr	-

1. Mobile Computing

Course Objective

1. To understand the fundamentals and various computational processing of mobile networks.
2. To study the specifications and functionalities of various protocols/standards of mobile networks.

Unit – 1: Introduction to Mobile Computing Architecture: Mobile Computing–Dialog Control–Networks– Middleware and Gateways–Application and Services–Developing Mobile Computing Applications– Security in Mobile Computing–Architecture for Mobile Computing–Three Tier Architecture–Design considerations for Mobile Computing–Mobile Computing through Internet–Making existing Applications Mobile Enabled.

UNIT –II: Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G: Bluetooth Radio Frequency Identification Wireless Broadband Mobile IP Internet Protocol Version6 (IPv6) Java Card– GSM Architecture–GSM Entities–Call Routing in GSM–PLMN Interfaces GSM addresses and Identifiers–Network aspects in GSM–Authentication and Security Mobile computing over SMS– GPRS and Packet Data Network–GPRS Network Architecture–GPRS Network Operations–Data Services in GPRS–Applications for GPRS–Limitations of GPRS–Spread Spectrum technology– Is-95–CDMAVersus GSM–Wireless Data– Third Generation Networks– Applications on 3G

UNIT –III: Wireless Application Protocol (WAP) and Wireless LAN: WAP MMS Wireless LAN Advantages– IEEE 802.11Standards–Wireless LAN Architecture–Mobility in wireless LAN **Intelligent Networks and Interworking :** Introduction – Fundamentals of Call processing – Intelligence in the Networks–SS#7 Signaling–IN Conceptual Model (INCM)–soft switch–Programmable Networks–Technologies and Interfaces for IN

UNIT –IV: Client Programming, Palm OS, Symbian OS, Win CE Architecture: Introduction–Moving beyond The Desktop–A Peekunder the Hood: Hardware Overview–Mobile phones–PDA Design Constraints in Applications for Handheld Devices–Palm OS architecture–Application Development Multimedia Symbian OS Architecture–Applications for Symbian, Different flavors of Windows CE Windows CE Architecture
J2ME:JAVA in the Handset–The Three-prong approach to JAVA Everywhere–JAVA2 Micro Edition (J2ME) technology–Programming for CLDC–GUI in MIDP–UI Design Issues–Multimedia Record Management System–Communication in MIDP–Security considerations in MIDP– Optional Packages

UNIT –V: Voice Over Internet Protocol and Convergence: Voice over IP- H.323 Framework for Voice over IP– Session Initiation Protocol – Comparison between H.323and SIP – Real Time protocols– Convergence Technologies –Call Routing–Voice over IP Applications–IP multimedia subsystem (IMS)– Mobile VoIP

Security Issues in Mobile Computing: Introduction–Information Security–Security Techniques And Algorithms–Security Protocols–Public Key Infrastructure–Trust–Security Models–Security frame works for Mobile Environment

Course Outcomes:

1. Students are capable to analyze and solve problems in the field of telecommunications.
2. Students will have the understanding of different generations, operations and design of wireless and mobile communications.

REFERENCE BOOKS:

1. Mobile Computing–Technology, Applications and Service Creation–Asoke K Talukder, Roopa R Yavagal,2009,TATA McGraw Hill
2. Mobile Communications–Jochen Schiller–2nd Edition–Pearson Education
3. The CDMA 2000 System for Mobile Communications– Vieri Vaughi, Alexander Damn Jaonvic–Pearson
3. Fundamentals of Mobile & Parvasive Computing- Adalestein, 2008, TMH

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

2. Satellite Communication & Services

Course Objective:

1. To make the students understand the basic concept in the field of Satellite Communication and to know how to place a satellite in an orbit.
2. To calculate the link power budget.
3. To get a complete knowledge about the earth and space subsystems.
4. To gain knowledge about the Satellite Access schemes.
5. To gain knowledge about the Satellite system and mobile services provided.

Unit 1: Orbital Aspects of Satellite Communication: Orbital mechanics–Equation of the orbit satellite, orbit location orbital elements looks angle determination sub–satellite point–elevation azimuth calculation arch space geometrical consideration–satellite antenna coverage calculation, effects of sun and moon ellipse duration sun transit, launches and launch vehicles. Mechanics of lunching a satellite ELV and STS vehicles election consideration for launch vehicle.

Unit 2: Multiple Access Techniques: Frequency division multiple access pre-assign FDM/FM/FDMS/SPACE operation, time division multiple accesses. High Rate TDMA frame operation. INTELSET TDMA operation. Code division multiple access, direct sequence and FH system, comparison of the various accessing techniques.

Unit 3: Earth Station Technology: Factors influencing the choice and location of the earth station and antenna system – Overall block diagram, satellite communication application, FFS, MSS, BSS, RDSS and RNS.

Unit 4: . Satellite Communication Link Design: Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

Unit 5: VHF and UHF: VHF Propagation Characteristics, Line of Sight Calculations, Antennas, Applications. **UHF**: Characteristics and Applications. **VSAT Systems:** Overview, Network Architecture, Access Control Protocol Basic Techniques- Multiple Access selection, signal formats, modulation, coding and interference, VSAT earth stations.

Course Outcomes: The students will be:

1. Able to learn the dynamics of the satellite.
2. Able to understand the communication satellite design.
3. Able to understand how analog and digital technologies are used for satellite communication networks.
4. Able to learn the design of satellite links.
5. Able to study the design of Earth station and tracking of the satellites.

REFERENCE BOOKS:

1. Satellite Communication- T. Pratt and C. Bostian, New York Wiley 1996.
2. Communication satellite system- G. Maral, M. Bousquet, Wiley1985.
3. Satellite Communications Technology- K. Miya, RDD engineering Tokyo Japan 1982.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 201	Advanced data communications	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective: The objectives of this course are to:
Introduce students to the evolution of computer networks and the concepts data communication; Introduce students the general principles of network design and compare the different network topologies. Introduce students to the digital and analogue representations and channels. Describe the mechanism and techniques of encoding. Introduce students to the general principles of circuit and packet switching. Introduce students to the wireless Local Area Networks, provide students with in-depth knowledge of data link layer fundamental such as error detection, correction and flow control techniques; multiple access control techniques.

UNIT -I:
Digital Modulation Schemes: BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems: Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control
Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques: Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization, Frequency- Division Multiple Access (FDMA), Time – Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Understand the basic principles of network design.

Understand the concept data communication within the network environment.

Understand the conflicting issues and resolution techniques in data transmission.

Understand the setting up of a network environment with all the necessary data communication components, procedure and techniques that make it functional.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems -T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 202	GSM Mobile: Network Planning & Optimization	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective:

1. To have an overview of wireless and mobile communications in different generations.
2. To study the operation of basic cellular system and performance criterion, handoff mechanism.
3. To study the design of cellular mobile system.
4. To develop the ability to search, select, organize and present information on new technologies in mobile and cellular communication.

UNIT -I:

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley- Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT -III:

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization- Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer,

Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration- Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

Course Outcomes:

4. Students are capable to analyze and solve problems in the field of telecommunications.
5. Students will have the understanding of different generations, operations and design of wireless and mobile communications.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE.
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press.
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 203	Spread Spectrum Techniques & CDMA Networks	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective

The objective of this subject is to provide the students with the understanding of basic principles in the generation and detection of spread spectrum signals. Examples on current applications and future development of spread spectrum communication systems will be described.

UNIT -I:

Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems:

Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT -II:

Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT -III:

Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT -IV:

Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity,

Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT -V:

Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

Course Outcome

1. Understand the architecture and elements of a spread-spectrum system and a CDMA system
2. Understand the characteristics of spread-spectrum signal waveforms
3. Apply their knowledge of communications technology to CDMA and wireless systems
4. Understand the methods for spread-spectrum and CDMA system performance analysis
5. Capture most recent development in CDMA and its role in 3G wireless systems

REFERENCE BOOKS:

1. George R. Cooper, Clare D. Mc Gillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2. Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1st
Edition, 1995.
3. Kamilo Feher - "Wireless Digital Communications," PHI, 2009.
4. Andrew Richardson - "WCDMA Design Handbook," Cambridge University Press, 2005.
5. Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 204	Elective II	4(3+1+0)	50	20	30	-	-	100	3 hr	-

MEWMC 204 (A) Coding Theory and Techniques

Course Objective:

1. To understand the concepts of Information theory and Coding.
2. To understand the fundamental limits prescribed by the information theory.
3. To learn the various coding schemes in detail.

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:

Burst –Error-Correcting Codes: Decoding of Single-Burst error Correcting Cyclic codes, Single- Burst-Error-Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst – Error- Correcting Cyclic and Convolutional codes.

UNIT -V:

BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

Course Outcomes:

1. The student will be in a position to quantify information.
2. To be able to design and implement various coding schemes.
3. To be able to apply coding techniques to information sources like video, audio and so on.

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.

REFERENCE BOOKS:

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th Ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-Oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

TMWC 204(B) Advanced Digital Signal Processing

Course Objective: This course will introduce the basic concepts and techniques for processing signals on a computer. By the end of the course, you be familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors. The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.

UNIT –I:

Review of DFT, FFT, IIR Filters and FIR Filters:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:

Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:

Non-Parametric Methods of Power Spectral Estimation: of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:

Implementation of Digital Filters: Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

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

1. Represent discrete-time signals analytically and visualize them in the time domain.
2. Understand the meaning and implications of the properties of systems and signals.
3. Understand the Transform domain and its significance and problems related tom computational complexity.
4. Be able to specify and design any digital filters using MATLAB.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.

3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH.
4. Digital Spectral Analysis – Jr. Marple

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 301	Adhoc and Wireless Sensor Networks	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective

1. The goal is to introduce students to the mathematical models and network protocol designs in wireless multi- hop networks
2. A systematic exposition of network protocols and their cross-layer interactions
3. A broad perspective on the active research areas in wireless multi-hop networks

UNIT-I: WIRELESS LANS AND PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standard, HIPERLAN Standard, Bluetooth, Home RF. **Wireless Internet:** Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web Over Wireless.

UNIT-II: ADHOC WIRELESS NETWORKS: Introduction, Issues in AdHoc Wireless Networks, ADHoc Wireless Internet. **MAC Protocols for AdHoc Wireless Networks:** Introduction, Issues in Designing a MAC protocol For AdHoc Wireless Networks, Design goals of a MAC Protocol for AdHoc Wireless Networks, Classifications of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with reservationMechanisms,Contention–BasedMACProtocolswithSchedulingMechanisms,MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT -III: ROUTING PROTOCOLS: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table–Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power– Aware Routing Protocols. **Transport Layer and Security Protocols:** Introduction, Issues in Designing a Transport Layer Protocol for AdHoc Wireless Networks, Design Goals of a Transport Layer Protocol for AdHoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

UNIT –IV: QUALITY OF SERVICE: Introduction, Issues and Challenges in Providing QoS in AdHoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for AdHoc Wireless Networks. **Energy Management:** Introduction, Need for Energy Management in AdHoc Wireless Networks, Classification of AdHoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

UNIT –V: WIRELESS SENSOR NETWORKS: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards ,Other Issues.

Course Outcomes:

Upon completion of the course the student will be able to,

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

TEXTBOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj,2004, PHI.
2. Wireless Ad-hocand Sensor Networks: Protocols, Performance and Control-Jagannathan Sarangapani, CRC Press

REFERENCEBOOKS:

1. Ad-HocMobileWirelessNetworks:Protocols&Systems,C.K.Toh,1ed.PearsonEducation.
2. Wireless Sensor Networks-C.S. Raghavendra, Krishna M.Sivalingam,2004, Springer

---

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 302	3G UMTS and 4th Generation Networks	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective: To train students, who have exposure to and are working in Mobile communication Field, in various generations of GSM technologies and advancements in GSM Mobile systems:

1. Migration path to 4G.
2. Fundamental of UMTS.
3. Detailed insight into the technology used in UMTS, 3G LTE and 4G networks.
4. UMTS, 3G LTE architecture.
5. Different protocols involved in achieving high data rates in 3G, LTE.
6. How OFDM, MIMO and SDR work.
7. 3G LTE air interface.

UNIT1:

RADIO FREQUENCY PLANNING FOR MOBILE NETWORK: RF Design Requirements, Capacity and Coverage Thresholds, Propagation Models, Link Budgets, ATOL-RF Planning Tool, Optimization Principle, Drive Test Tool.

UNIT2: OFDM PRINCIPLES: Motivation for Multi Carrier Vs. Single Carrier, Sub Carrier Symbol Structure, Generation of OFDM symbols using the IFFT, Cyclic prefix (guard interval), OFDM signal bandwidth, Multipath interference on an OFDM symbol, Protecting against multipath using cyclic prefix, Reducing bandwidth(windowing vs filtering), Peak-to-average power ratio(PAPR), Minimising /reducing PAPR,SC-FDMA.

UNIT3: 3G WIDE BAND CDMA Rake Receiver Principle, 2G IS-95 CDMA discussion, Rake finger architecture and performance, PN Code properties, WCDMA Physical Layer overview, High speed downlink packet access (HSDPA), High speed uplink packet access (HSUPA) overview, Capacity improvement in multi path environment.

UNIT4: MIMO BASICS: Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems, Spectral efficiency and capacity, Transmitting independent streams in parallel, The generic MIMO problem, Singular Value Decomposition, Pre distortion in MIMO systems, Disadvantages of pre distortion in MIMO systems, Precoding and combining in MIMO systems, Advantages of precoding and combining, Disadvantages of precoding and combining, Beamforming Analog and Digital Networks, Case study: MIMO in LTE.

UNIT5: LTE Vs. WI-MAX: 3GPP evolution towards LTE/LTE-Advanced standardization, LTE/LTE-Advanced Radio Resource Management, Radio network deployment and frequency planning, Spectrum management, Satellite wireless mobile Communication, 4G Mobile WiMAX (IEEE802.16m-2011), Femto cells in advanced WiMAX systems, WiMAX Interworking with LTE/LTE-Advanced networks, Mobile IP, IEEE802.21 for seamless ,Mobility, 4G regulation: Mobile WiMAX and LTE/LTE-Advanced.

Course Objective

At the end of the course the participants will be able to:

1. Identify different Nodes and the interfaces of the 3G and beyond 3G network architecture.
2. List the functions of the components of the 3G and Beyond 3G network.
3. Explain various Access methods and Advance Modulation Techniques.
4. Explain the Radio Resource Functions of 3G and Beyond 3G technologies.
5. Explain Security aspects in UMTS Networks.
6. Explain the concept of EUTRAN and EPC.
7. Explain the spectrum requirements and usage in LTE and LTE advanced / 4G.

TEXTBOOK:

1.Mitola III, J., "Cognitive Radio Architecture: The Engineering Foundation of Radio XML", Wiley-Inter science. 2006

2. Pietrzyk,S., "OFDMA for Broadband Wireless Access", Artech House. 2006

3. Gilsic, S.G., "Advanced Wireless Networks: 4G Technology", John Wiley & Sons. 2006

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMWC 303	**Optical networks**	4(3+1+0)	50	20	30	-	-	100	3 hr	-

Course Objective:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

UNIT I:

OPTICAL COMMUNICATION TECHNOLOGY: Signal propagation in Optical Fibre: Geometric Optics approach/ Wave Theory Approach, Loss & Bandwidth, Chromatic dispersion, Non linear effects, Stimulated Brillouin and stimulated, Raman Scattering, Propagation in a non linear medium, self phase modulation and cross phase modulation, four wave mixing, principle of Solitons.

UNIT II:

FIBER OPTIC COMPONENTS FOR COMMUNICATION & NETWORKING: Couplers, isolators and circulators, multiplexers, Bragg grating, Fabry parot filters, Mach zender interferometer, arrayed waveguide grating, tunable filters, high channel count multiplexer architures, optical amplifiers, direct and external modulation transmitters, pump sources for amplifiers, optical switches and wavelength converters.

UNIT III:

MODULATION & DEMODULATION: Single formats for modulation, subcarrier modulation and multiplexing, optical modulation- Duo binary, single side band and multi level schemes, ideal & practical receivers for demodulation, bit error rates timing recovery and equalization, Reed-Solomon codes for error detection and correction.

UNIT IV:

TRANSMISSION SYSTEM ENGINEERING: System model, power penalty in transmitter and receiver, optical amplifiers, cross talk and reduction of crosstalk, cascaded filters, dispersion limitations and compensation techniques.

UNIT V:

FIBER NON-LINEARITIES AND SYSTEM DESIGN CONSIDERATIONS: Limitation in high speed and WDM systems due to Non linearity's in fibers, wavelength stabilization against temperature variations, overall system design considerations, Modulation, Non-Linear effects, wavelengths, all optical networks.

Course Outcome

1. To design the various access networks.
2. To be able to design the 4G and LTE networks.
3. To design broadband fiber optic networks.
4. To design Hybrid wireless – optical networks

TEXTBOOKS:

1. Optical Networks: A Practical Perspective-Rajiv Rama swami and Kumar N. Sivarajan,2nd Ed.,2004, Elsevier Morgan Kaufmann Publishers.
2. Optical FiberCommunications–GerdKeiser,3rdEd.,2000,McGrawHill.

REFERENCEBOOKS:

1. Optical Fiber Communications: Principles and Practice– John.M.Senior,2nd Ed.,2000,PE.
2. Fiber Optics Communication–Harold Kolimbris,2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems–UylessBlack,2nd Ed.,2009,PEI.
4. Optical Fiber Communications–Govind Agarwal,2nd Ed.,2004,TMH.
5. Optical Fiber Communications and Its Applications– S.C.Gupta,2004, PH

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
TMMC 304	ELECTIVE III	4(3+1+0)	50	20	30	-	-	100	3 hr	-

1. SOFTWARE DEFINED RADIO

Course Objective

This course describes the fundamental radio components and how these components are implemented in software. The principles of software architecture to support the SDR will be developed. Policy and cooperation mechanisms that enable SDR to interoperate will be developed. In this course you will study and build SDR and investigate their role in future communication systems.

UNIT I Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio-Design Principles of Software Radio, RF Implementation issues-The Purpose of RF Front–End, Dynamic Range-The Principal Challenge of Receiver Design–RF Receiver Front-End Topologies-Enhanced Flexibility of the RF Chain with Software Radios-Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain ,ADC and DAC Distortion.

UNIT -II: Multi Rate Signal Processing: Introduction-Sample Rate Conversion Principles-Poly phase Filters-Digital Filter Banks-Timing Recovery in Digital Receivers Using Multi rate Digital Filters. **Digital Generation of Signals:** Introduction-Comparison of Direct Digital Synthesis with Analog
Signal Synthesis-Approaches to Direct Digital Synthesis-Analysis of Spurious Signals-Spurious Components due to Periodic jitter-Band Pass Signal Generation-Performance of Direct Digital Synthesis Systems-Hybrid DDS-PLL Systems-Applications of direct Digital Synthesis-Generation of Random Sequences-ROM Compression Techniques.

UNIT -III: Analog to Digital and Digital to Analog Conversion: Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance-Common ADC and DAC architectures.

UNIT -IV: Digital Hardware Choices: Introduction- Key Hardware Elements- DSP Processors- Field
Programmable Gate Arrays-Trade-Offs in Using DSPs, FPGAs ,and ASICs-Power Management Issues-Using a Combination of DSPs, FPGAs ,and ASICs.

UNIT -V: Object–Oriented Representation of Radios and Network Resources: Networks-Object Oriented Programming –Object Brokers-Mobile Application Environments-Joint Tactical Radio System.

Case Studies in Software Radio Design : Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System,SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXTBOOKS:

1. Software Radio: A Modern ApproachtoRadioEngineering-JeffreyH.Reed,2002,PEA Publication
2. Software Defined Radio: Enabling Technologies-Walter Tuttle Bee, 2002, Wiley Publications.

Course Objective:

Students who successfully complete this course will have

1. An ability to make system-level decisions for software-defined radio technology and products
2. Knowledge of software development methods for embedded wireless systems
3. An ability to implement smart antenna algorithms
4. Knowledge of digital hardware architectures and understanding of development methods
5. An understanding of middleware in SDR
6. Understanding of analog RF components

REFERENCEBOOKS:

1. Software Defined Radio for 3G-Paul Burns, 2002, Artech House.
2. Software Defined Radio: Architectures, Systems and Functions- Markus Dillinger, Kambiz Madani, NancyAlonistioti,2003,Wiley.
2. Software Radio Architecture: Object Oriented Approaches to wireless System Enginering– JosephMitola,III,2000,JohnWiley&Sons.
3. R.F. Microelectronics– B.Razavi,1998,PHI
4. DSP –A Computer Based Approach– S.K.Mithra,1998,McGraw-Hill

---

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

2. Security in wireless and mobile networks

Course Objective

1. To learn the fundamentals of cryptography and its application to network security.
2. To understand the mathematics behind cryptography.
3. To study about network security threats, security services, and counters measures.
4. To learn about the principles and protocols that enables its application to wired and wireless networks.
5. To develop an understanding of security policies such as authentication, integrity and confidentiality as well as protocols to implement such policies.

I INTRODUCTION & REVIEW WIRELESS Communications vs. Networking, 802.11 Framing, Mobility & Roaming

II SECURITY MODELS &WIRELESS NETWORK VULNERABILITIES AND IDS/IPS Security Context, Security Architecture, War Driving, War Riding, War Walking, &War Chalking, Scanning, Denial of Service, Man-in-the-Middle, "Evil Twin"
Access Points

III PREVIOUS802.11SECURITY MAC Address Filtering,64, 128,and256-bitWEP,SSID-BasedAttempts,VPN- Based Solutions, IP sec, Issues &Weaknesses

IV WPA COMPONENTS 802.1x& 802.1aa, Extensible Authentication Protocol, TKIP,WPA-PSK

V 802.11I(WPA2) Transitional Secure Network, Robust Secure Network, EAP, LEAP, PEAP,EAP- FAST, TLS & TTLS, AES, CCMP, Authentication Servers-RADIUS, Kerberos

Security in Wireless and Mobile Systems

Overview: Security - Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Policy and relevant definitions Authentication – Different techniques Cryptography – Symmetric Key Cryptography, Asymmetric key Cryptography, Key management, Digital signatures, Certificate Distributed Systems Security – Cipher techniques, Protection systems, Example protocols Wireless and Mobile system security – Strategies, Routing security, Different schemes for MANET

Course Outcomes

1. To design cryptographic algorithms and carry out their implementation.
2. To be able to do cryptanalysis on cipher.
3. To be able to design and implement security protocols.

TEXTBOOKS AND REFERENCES

1 .Introduction to cryptography–H Delfs H.Hneber–2002 Springer

2 Introduction to cryptography–J.A.Buchamann–2001 Springer

3. Information Security and Cryptography–ICISC 2001.K Kim, Ed 2002 vol 2288 Springer

4. Understanding data comm./and network shay vikas, Thomas Pub

5. Information security and cryptography. ISISC 2000 by DWon Vol 2015etc
2001 Springer

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
STWC-308	**MATLAB**		50	20	30	30	20	150	3 hr	2hr

Introduction to Matlab 1. Matlab as {best} calculator 2. Standard Matlab windows 3. Operations with variables a) Naming b) Checking existence c) Clearing d) Operations 4. Arrays a) Columns and rows: creation and indexing b) Size & length c) Multiplication, division, power d) Operations 5. Writing script files a) Logical variables and operators b) Flow control c) Loop operators 6. Writing functions a) Input/output arguments b) Function visibility, path. c) Example: Matlab startup 7. Simple graphics a) 2D plots b) Figures and subplots

II) Data and data flow in Matlab. 1. Data types a) Matrix, string, cell and structure b) Creating, accessing elements and manipulating of data of different types 2. File Input-Output a) Matlab files b) Text files c) Binary files d) Mixed text-binary files 3. Communication with external devices a) Serial port b) Parallel port c) Sound card d) Video input

III) Function minimization and parameters search. 1. Polynomial fit a) 1D and 2D fits b) Data windowing c) Error bounds 2. Arbitrary function fit a) Error function b) Fixing parameters 3. Goodness of fit 2 criteria a) b) Error in parameters

IV) Handle graphics and user interface. 1. Pre-defined dialogs 2. Handle graphics a) Graphics objects b) Properties of objects c) Modifying properties of graphics objects 3. Menu-driven programs a) Controls: uimenu and uicontrol b) Interactive graphics c) Large program logic flow.

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal

Department: Electronics and Communication Engineering

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			Major	Minor	Sessional.	End Sem	Lab Work			
STWC 307	Optical Fiber Splicing		30	10	10	50	50	150	3 hr	2 hr

UNIT I

Theory and Principles of Fiber Optics: The Origins of Fiber Optic Communications, Basics of Fiber Optics Principles of Operation , System Parameters Fiber Manufacture, Understanding the "dB" of Fiber Optic Measurements, Free Space Optics ,Fiber Optic Installation Safety Keeping up to Date , Resource Guide to Fiber Optics ,Fiber Optic Economics:- Fiber or Copper, Fiber Applications, Fiber Performance.

UNIT II

Network Design (Sources and Cable selection): Guidelines for Fiber Optic Design and Installation, Light Sources, LED, Vertical Surface Emitting Lasers, Lasers Modulation, Optical Fiber Cables Multimode Restricted Mode Launch Bandwidth, Laser Optimized Multimode, Single-mode Optical Fiber Cable Construction, Cable Parameter and typical Values.

UNIT III

Fiber Termination Splicing and Hardware: Fiber Optic Safety ,Fiber Optic Terminations: (Connectors, Splices and Joints) , Fiber Optic Tools ,Termination Methods ,Fusion Splicing Methods ,Mechanical Splicing, Striping, Cleaning, and Cleaving ,Fiber End-Face Polish Techniques ,Connector Guidelines Storage loops, Fiber Optic Restoration ,Proactive Planning versus Reactive Restorations Equipment Used in Restoration.

UNIT IV

Optical Testing and Measurement: - Reasons for Testing Acceptance Testing, Types of Test Measurements, Link Loss Calculation Power Budget and Rise time calculations, Network Testing, Network Utilities Week.

Fiber Related Standards and Codes: - The National Electrical Code ANSI/TIA/EIA Building codes and Engineering updates TIA/EIA-568-B TIA/EIA-606-B , Guidelines for Fiber Optic Design

and Installation, Cable Guidelines, Connector Guidelines Cable Parameters and Typical Values, Installation Specifications Specifying Fiber Optic Cable, Environmental Specifications Cable Plant Documentation, Documentation Software.

UNIT V

FDDI & Ethernet: Introduction to How Ethernet Works, Local Area vs. Wide Area General Model of Communications, OSI Model, Comparison of OSI Model and the TCP/IP Model, Carrier Sense Multiple Access/Collision Detection, Differential Mode Delay.10/Gigabit/1000Mbps/100Mbp s/10Mbps,Limitations of Ethernet, Fiber Distributed Data Interface Functionality ,FDDI Transmission Media ,FDDI Specifications ,FDDI Frame Format ,FDDI Fault Tolerance.

References:

1. Keiser: Optical Fiber Communications, TMH.
2. Senior: Optical Fiber Communication- Principles and Practices, Pearson Education.
3. Agarwal: Fiber Optic Communication Systems, Wiley India.. Palais: Fiber Optics Communications, Pearson Education.
4. Satish Kumar: Fundamentals of optical Communications, PHI Learning.
5. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
6. Ghatak and Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
7. Gupta: Optoelectronic Devices and Systems, PHI Learning.Sterling: Introduction to Fiber Optics, Cengage Learning\

List of Experiments (Expandable):

1. Introduction to Fiber Optic Cables—Stripping and Cleaving
2. Fiber Optic Connectors
3. Fiber Optic Test Set
4. Fusion Splicing
5. Wavelength Division Multiplexing
6. The Optical Time Division Reflectometer
7. Fiber optic Star Coupler
8. Transmission of Light between two fibers.
9. Fiber optics transmission sensor.
10. Setting of fiber optics analog link.
11. Study of losses in optical fiber.
12. Measurement of numerical aperture.
13. Setting up fiber optics digital link.
14. Principal of Semiconductor Laser Diode.
15. Study of characteristics of fiber optics LED and Photo Detector.
16. Study of time division de-multiplexing

(Board of studies) **(Dean Faculty)** **(Registrar)**

Seal