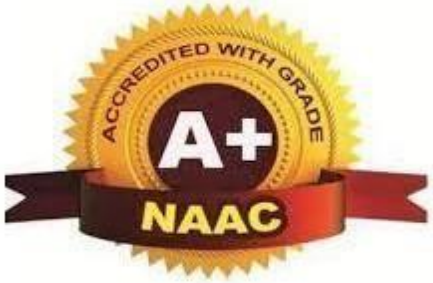
TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

(An Autonomous Institute)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.Tech Electronics Engineering(Communication)

NEP Structure & Curriculum

From

AcademicYear 2024-25

Vision of Institute: To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management

Mission of Institute

[M1]: To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

[M2]: To provide facilities and services to meet the challenges of Industry and Society.

[M3]:To facilitate socially responsive research, innovation and entrepreneurship.

[M4]: To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department To emerge as a learning Hub and center of excellence in the domain of Electronics and Communication Engineering. .

Mission of the Department

[M1]: To impart quality technical education through effective teaching learning process.

[M2]: To provide a platform for addressing societal issues and challenges encountered by industries.

[M3]: To foster a culture of research and instill innovative and entrepreneurial skills.

[M4]: To promote lifelong learning in order to foster the holistic development of students and staff through the knowledge and professional ethics.

Program Education Objectives (PEO)

[PEO1]: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in Electronics and Communication Engineering.

[PEO2]: Apply field knowledge, research and professional practices to meet the requirements of industries.

[PEO3]: Imbibe lifelong learning practices and entrepreneurship skills in tune with emerging technologies.

[PEO4]: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

Program Outcomes (PO)

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12.Lifelong learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

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NEPAutonomySchemeofInstructionsandSyllabus

SchemeofInstructionsforFirstYearM.Tech.ProgrammeinElectronicsEngineering(Communication)

Semester–I(w.e.f.:AY2024-25)

Sr. No.	Course Category	CourseCode	CourseTitle	L	T	P	Contact Hrs/week	Credits	ExamScheme				
									CT-1	CT-2	TA/AC	ESE	TOTAL
1	PCC	MEC21101	Embedded SystemDesign&Application	4	-	-	4	4	20	20	-	60	100
2	PCC	MEC21102	Digital CommunicationTechnology	4	-	-	4	4	20	20	-	60	100
3	PCC	MEC21103	AdaptiveSignal Processing	4	-	-	4	4	20	20	-	60	100
4	PCC	MEC21104	WirelessSensor Networks	4	-	-	4	4	20	20	-	60	100
5	PEC	MEC21105-7*	ProgramElective-I	4	-	-	4	4	20	20	-	60	100
6	PCC	MEC21108	Digital CommunicationTechnologyLab	-	-	2	2	1	-	-	25	25	50
			Total	**20**	**-**	**2**	**22**	**21**	**100**	**100**	**25**	**325**	**550**

L-Lecture T-Tutorial P-Practical CT1-Class Test1 CT2-Class Test2 TA/CA- Teacher Assessment / Continuous AssessmentESE-End SemesterExamination (For Laboratory:End SemesterPerformance)

***-Indicatesoutofthe03coursecodeeachstudenthastoselectanyoneProgramElective.**

PROGRESSIVETOTALCREDITS=21

Chairman BoS (ECE)
HOD
Department of Electronics & Comm.
Tulsiramji Gaikwad - Patil College
of Engineering & Technology, Nagpur

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Dean Academics
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College Of Engineering
and Technology. Nagpur

Vice-Principal
Vice Principal
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College Of Engineering &
Technology. Nagpur.

Principal
Principal
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NEPAutonomySchemeofInstructionsandSyllabus

Scheme of Instructions for First Year M. Tech. Programme in Electronics

Engineering(Communication)Semester–II(w.e.f.:AY2024-25)

Sr. No.	Course Category	CourseCode	CourseTitle	L	T	P	ContactHrs /week	Credits	ExamScheme				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	PCC	MEC21201	Optical Communication System	4	-	-	4	4	20	20	-	60	100
2	PCC	MEC21202	Smart Antenna	4	-	-	4	4	20	20	-	60	100
3	PCC	MEC21203	Advanced Communication Network	4	-	-	4	4	20	20	-	60	100
4	PEC	MEC21204-6*	Program Elective-II	4	-	-	4	4	20	20	-	60	100
5	RM	MEC21207	Research Methodology	4	-	-	4	4	20	20	-	60	100
6	PCC	MEC21208	Optical Communication System Lab	-	-	2	2	1	-	-	25	25	50
			Total	**20**	**-**	**2**	**22**	**21**	**100**	**100**	**25**	**325**	**550**

L-Lecture T-Tutorial P-Practical CT1-Class Test1 CT2-Class Test2 TA/CA- Teacher Assessment / Continuous AssessmentESE-End SemesterExamination (For Laboratory:End SemesterPerformance)

***-Indicatesoutofthe03coursecodeeachstudenthastoselectanyoneProfessionalElective.**

PROGRESSIVETOTALCREDITS=21+21 =42

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NEPAutonomySchemeofInstructionsandSyllabus

Scheme of Instructions for Second Year M. Tech. Programme in Electronics Engineering

(Communication)Semester–III(w.e.f.:AY2024-25)

Sr. No.	Cours Category	Course Code	CourseTitle	L	T	P	Contact Hrs/week	Credits	ExamScheme				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	PCC	MEC22301	IOT and Application	4	-	-	4	4	20	20	-	60	100
2	PEC	MEC22302$	MOOCS/NPTEL Courses	-	-	-	-	3	-	-	-	-	-
3	OJT/FP	MEC22303	Project Dissertation Phase-I	-	-	11	11	11	-	-	100	100	200
			Total	**4**	**-**	**11**	**15**	**18**	**20**	**20**	**100**	**160**	**300**

Note:

1. In Case, the course offered online are not completely relevant with the topic of dissertation then any course suggested by NASSCOM on recenttechnologiescan beopted bycandidate.
2. $ Programme coordinator will provide list of 03 MOOC courses of minimum 12 weeks duration (as per availability). Students are expected to complete anyone out ofthreecoursesinorder togetthe requiredcredits.

L-Lecture T-Tutorial P-Practical
CT1-ClassTest1 TA/CA-TeacherAssessment/Continuous Assessment
CT2-ClassTest2 ESE- End Semester Examination (For Laboratory End Semester performanceOJT/FP-OnJobTraining: Internship/Apprenticeship

PROGRESSIVETOTALCREDITS= 42+18=60

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NEPAutonomySchemeofInstructionsandSyllabus

Scheme of Instructions for Second Year M. Tech. Programme in Electronics Engineering

(Communication)Semester–IV(w.e.f.:AY2024-25)

Sr. No.	Course Category	Course Code	CourseTitle	L	T	P	ContactHrs/week	Credits	ExamScheme				
									CT-1	CT-2	TA /CA	ESE	TOTAL
1	OJT/FP	MEC22401	Project DissertationPhase-II	-	-	20	20	20	-	-	200	200	400
			Total	**-**	**-**	**20**	**20**	**20**	**-**	**-**	**200**	**200**	**400**

Note:

TA/CA-TeacherAssessment/ContinuousAssessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)OJT/FP-OnJob Training: Internship/Apprenticeship

PROGRESSIVETOTALCREDITS=60+20=80

Chairman BoS (ECE)

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Dean Academics
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and Technology. Nagpur

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College Of Engineering &
Technology. Nagpur.

Principal

Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology. Nagpur

List of Program Elective Courses

Semester-I		Semester-II	
Course Code	**Program Elective-I**	**Course Code**	**Program Elective-II**
MEC21105	Active RF Devices and Circuits	**MEC21204**	Artificial Neural Networks and Application
MEC21106	Industrial Communication Systems	**MEC21205**	Satellite Communication
MEC21107	Telecommunication Networks	**MEC21206**	Advanced Wireless Communication

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First Year (Semester-II) M.TechElectronics (Communication) Engineering

Semester : II	**MEC21201:Optical Communication System**

Teaching Scheme		**Examination Scheme**	
Lectures	4 Hrs/week	**CT-1**	15 Marks
Tutorial	-	**CT-2**	15 Marks
Total Credit	4	**TA**	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

1.Analyze the optical fiber based systems with application.
2.Design optical fiber based networks and Wavelength rerouting algorithms.
3.Integrate the emerging research areas in the field of sensor networks after successful completion of this course.
4.Examine various MAC protocols used for different communication standards used in WSN.
5.Evaluate new protocols for WSN and WDM network.

Course Contents

Unit I	Introduction to WDM optical networks, Evolution, Enabling technologies for WDM Optical Networks, WDM optical networks architectures, issues in wavelength routed networks, Classification of RWA Algorithm, RWA algorithm, Distributed control Protocols, Permutation routing and wavelength requirements
Unit II	Need for wavelength converters, wavelength convertible Switch architectures, Routing in convertible networks, Performance evaluation of convertible networks, converter placement problems, converter allocation problems, Wavelength rerouting algorithms-algorithm AG, algorithm MWPG ,Rerouting in WDM networks with sparse wavelength conversion
Unit III	Virtual topology design: Introduction, Design problems, virtual topology design sub-problems, virtual topology problem formulation, virtual topology design heuristics, need for virtual topology reconfiguration.
Unit IV	Network survivability and provisioning: Failures and recovery, Restoration schemes, Multiplexing Techniques, Backup multiplexing based Routing, Distributed control Protocols, survivability in WDM Ring networks, Network survivability
Unit V	Introduction next generation optical internet networks, Optical Circuit switching, optical Burst switching , Optical packet switching ,KEOPS Optical packet switching network, WASPNET Switch ,Photonic slot routing, MPLS in WDM networks

Text Books

T.1	John M. Senior, "Optical fiber communication", Pearson edition, 2000
T.2	Rajiv Ramswami and K. N. Sivarajan, "Optical Networks", Morgon Kauffman Publishers, 2000.

Reference Books

R.1	C.Siva Ram Murthy and Mohan Gurusamy," WDM Optical Networks "Pearson Education,2003
R.2	Rajiv Ramswami and K. N. Sivarajan, "Optical Networks", Morgon Kauffman Publishers, 2000.

Useful Links

1	https://nptel.ac.in/courses/117/101/117101002/
2	https://nptel.ac.in/courses/108/106/108106167/

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Program: M.Tech. Electronics Engineering (Communication)

Semester: II

MEC21202 : Smart Antenna

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
TotalCredit	4

Examination Scheme	
CT-1	15Marks
CT-2	15Marks
CA	10Marks
ESE	60Marks
Total	100Marks

DurationofESE:03Hrs00Min.

Course Outcomes:

Studentswill beableto

1.	**Examine** the wire antenna and microstrip Antenna using the concept of Monopole antenna.
2.	**Analyze** the side lobe cancellers using Array Antenna .
3.	**Examine** the Narrowband antenna using the concept of Beamformer.
4.	**Identify** jamming of Beamformer for antenna using Least mean square algorithms.
5.	**Design** wireless communication by using AI with smart antenna systems.

Course Contents

Unit I	**Fundamental Concepts of Wire Antennas and Microstrip Antennas:** Physical concept of radiation, Radiation pattern near and far-field regions, antenna, theoremformulation of fundamental antenna properties, Friis transmission equation, radiation integrals and auxiliary potential functions, Infinitesimal dipole, finite length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop, Reconfigurable antennas, PIFA, MIMO antennas, Massive MIMO
Unit II	**Array Antenna Fundamentals**: Linear Arrays, Array Weighting, Beam steered Arrays, Circular Arrays, Fixed Beam and Sectored Arrays. Sidelobe Chancellors,Retro directive Arrays.
Unit III	**Narrowband Processing:** Signal Model, Steering Vector Representation, Conventional Beamformer,Source in Look Direction, Directional Interference, Random Noise Environment, Signal-to-NoiseRatio,Elevation angle of Arrival, Null Steering Beamformer, Optimal Beamformer: Unconstrained Beamformer, Constrained Beamformer, Output Signal-to-Noise Ratio and Array Gain, Optimization Using Reference Signal, Beam Space Processing
Unit IV	**Adaptive Processing:** Sample Matrix Inversion Algorithm, Unconstrained Least Mean SquaresAlgorithm, Gradient Estimate, Covariance of Gradient, Convergence of Weight Vector, WeightCovariance Matrix, Transient Behavior of Weight Covariance Matrix, Excess Mean Square Error,Misadjustment, Normalized Least Mean Squares Algorithm, Constrained Least Mean SquaresAlgorithm

Unit V	**AI and Machine Learning in Smart Antennas:** Integration of AI and machine learning for adaptive antenna systems, Deep learning for channel prediction and beamforming, Reinforcement learning in antenna array management and Smart antenna self-optimization using AI.
Text Books	
T.1	C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley, 3rd edition, 2005.
T.2	Smart Antenna by L.C. Godara, CRC Press
T.3	Smart Antennas, Tapan A. Sarkar ,M. C. Wicks, M. Salazar-Palma, R. J. Bonneau , Wiley
T.4	Smart Antennas for Wireless Communications By Frank Gross, McGraw hill
Reference Books	
R.1	Stutman and Thiele, "Antenna theory and design", 2nd edition John Wiley and sons Inc.
R.2	“Introduction to Smart Antennas”, Constantine A.Balanis, Panayiotis ,Morgan & Claypool ,1st edition,2007
R.3	Sachidnanda et al, "Antennas and propagation", Pearson Education
Useful Links	
1	http://www.digimat.in/nptel/courses/video/108101112/L40.html
2	https://archive.nptel.ac.in/courses/108/101/108101112/
3	https://www.youtube.com/watch?v=h51mFbIgZRI

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Program:M.TechElectronics (Communication)Engineering

Semester: II

MEC21203: Advanced Communication Network

Teaching Scheme	
Theory	4Hrs/week
Tutorial	--
TotalCredits	**4**

Examination Scheme	
CT-I	15Marks
CT-II	15Marks
CA	10 Marks
ESE	60Marks
TotalMarks	**100Marks**

DurationofESE:03Hrs00Min.

Course Outcomes:

Students will be able to

1.	**Analyze** TCP/IP,UDP,HTTP/HTTPS,DNS,DHCP,SNMP
2.	**Examine** Awareness and possibilities in Real Time Communication techniques.
3.	**Identify** the possibilities with scheduling techniques in networking.
4.	**Identify** Packet classification and control techniques for networking.
5.	**Classify** IP-relatedtechnologiesandprotocolsincludingIPv4,IPv6,IPtunneling, IP switching, and MPLS.

Course Contents

Unit I	**Functional Elements and Current Practice in Networking:** Networking as Resource Sharing, Analogy with the Operating System of a Computer, The Functional Elements: Multiplexing, Switching, Routing, Network Management, Traffic Controls and Timescales, Current Practice: Network Infrastructure, Networking Architectures, Telephone and ISDN Networks, X.25 and Frame Relay Networks, The Internet, and Asynchronous Transfer Mode(ATM)Networks.
UnitII	**Wireless Networks:** Bits over a Wireless Network, TCP Performance over Wireless Links, Adaptive and Cross-Layer Techniques, Random Access: Aloha, S-Aloha, and CSMA/CA, Wireless Local Area Networks, Wireless AdHoc Networks, Link Scheduling and Network Capacity, Scheduling Constraints, Centralized Scheduling, Capacity of a WANET, Wireless Sensor Networks: An Overview.
UnitIII	**Packet Processing:** Addressing and Address Lookup, Addressing, Addressing in IP Networks: Subnets and Classless Inter domain Routing, Efficient Longest Prefix Matching: Level-Compressed Tries, Hardware Based Solutions, Packet Classification
UnitIV	**Admission control in Internet.** ConceptofEffectivebandwidth.Measurementbasedadmissioncontrol.DifferentiatedServicesinInternet(DiffServ).DiffServ architecture and framework

UnitV	**IPv4,IPv6,IPTunneling,IPSwitching,andMPLS**:Overview of IP over ATM and its Evolution to IP Switching, MPLS Architecture and Framework, MPLS Protocols, Traffic Engineering Issues in MPLS

Text Books	
T.1	GaryJ.Mullett,"IntroductiontoWirelessTelecommunicationsSystemsandNetworks",CENGAGE
T.2	UpenaDalal,"WirelessCommunication",OxfordUniversityPress,2009
Reference Books	
R.1	Ke-LinDu&MNSSwamy,"WirelessCommunicationSystem",CambridgeUniversityPress,2010
R.2	Gottapu Sasibhusan Rao,"Mobile Cellular Communication ",PEARSON
Useful Links	
1	https://archive.nptel.ac.in/courses/106/106/106106243/
2	https://www.ee.iitb.ac.in/~sarva/courses/EE706/2012/EE706LecNotes.pdf

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First Year (Semester-II) M.TechElectronics (Communication) Engineering

Semester : II

MEC21204:Artificial Neural Networks (ANN) and Applications (PE-II)

Teaching Scheme	
Lectures	4 Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO):

Students will be able to

1. **Describe** the principles of Neural Networks.
2. **Identify** different types of models of artificial neural networks.
3. **Analyze** the feed-forward neural networks.
4. **Analyze** the feedback neural networks.
5. **Compare** different applications of artificial neural networks.

Course Contents

UnitI	Introduction: Biological neurons and memory, Structure and function of a single neuron, Artificial Neural Networks (ANN).
UnitII	Typical applications of ANNs: Classification, Clustering, Vector Quantization, Pattern Recognition, Function Approximation, Forecasting, Control, Optimization; Basic Approach of the working of ANN – Training, Learning, and Generalization
UnitIII	Supervised Learning: Single-layer networks, Perceptron-Linear reparability, Training algorithm, Limitations; Multi-layer Networks-Architecture, Back Propagation Algorithm (BTA) and other training algorithms, Applications. Adaptive Multi-Layer Networks-Architecture, training algorithms; Recurrent Networks; Feed-forward networks; Radial-Basis-Function (RBF) networks;
UnitIV	Unsupervised Learning: Winner-takes-all networks, Hamming networks, Magnet, Simple competitive learning, Vector-Quantization; Counter propagation networks, Adaptive Resonance Theory, Kohonen's Self-organizing Maps, Principal Component Analysis.
UnitV	Adeline and Madeline Networks: Introduction, Adeline, Madeline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

TextBooks

T.1	Sivanandam, S Sumathi, S N Deepa; **"Introduction to Neural Networks",** 2nd ed. **TATA McGraw HILL : 2005.**
T.2	Hassoun Mohamad H., **Fundamentals Of Artificial Neural Networks,** Phi Learning Private Limited
T.3	**Artificial Neural Network** Schalkoff Robert J., **MC GRAW HILL**

ReferenceBooks

R.1	Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
R.2	B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005
R.3	Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003
UsefulLinks	
1	https://nptel.ac.in/courses/121/106/121106014/
2	https://nptel.ac.in/courses/108/108/108108078/

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First Year (Semester-II) M.TechElectronics (Communication) Engineering

Semester : II | **MEC21205:Satellite Communication (PE-II)**

Teaching Scheme	
Lectures	4 Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO):

Students will be able to

1. **Describe the** knowledge of earth station components, Orbital Mechanics and Parameters, and components involved in frequency conversion including transponder hopping
2. **Explain** the transponder channelization methods and satellite link budget analysis, considering factors such as gain, losses, and signal strength.
3. **Analyse** the concept of TDMA frame acquisition, synchronization, and satellite position determination for seamless communication
4. **Evaluate** the challenges of synchronization in FH and DS systems and propose methods for achieving efficient synchronization.
5. **Evaluate** the importance of network error control and polling mechanisms in ensuring reliable data transmission in VSAT networks.

Course Contents

UnitI	**Satellite Description**: Communication subsystem, Telemetry, command and ranging subsystem, altitude control subsystem, electrical power subsystem, orbital period and velocity, placement of satellite in geostationary orbit. **Earth station:** earth station antenna type, gain, pointing loss. Antenna gain to noise temperature variation G/T. G/T measurements. Antenna tracking power amplifier, low noise amplifier, Up-converter, Down converters–conversion process; transponder hopping, polarization hopping, Spurious effect of frequency conversion.
UnitII	**Satellite transponder:** Transponder model, transponder channelization, frequency plans and processing transponders. **Satellite link:** Basic link analysis, interference analysis, Rain induced attenuation, satellite link design, link with frequency reuse and link without frequency reuse, satellite multiple access system. Frequency Division Multiple Access: Principle, SPADE, FDM-FM-FDMA, Companded FDM-FM FDMA and SSB-AM-FDMA, Intermediation products in FDMA, optimized carrier-to-intermediation plus noise ration.
UnitIII	**Time Division Multiple Access:** Principle, TDMA frame structure, TDMA burst structure, TDMA super frame structure, frame acquisition and synchronization. Satellite position determination, TDMA timing. Demand Assignment Multiple Access and digital speech interpolation. Earlang B formula. Type of demand assignment, DAMA characteristics, DAMA interfaces, SCPC- DAMA, digital speech interpolation. Satellite packet communication.
UnitIV	**Satellite Spread Spectrum Communication:** Direct Sequence Spread Spectrum System, Direct Sequence Code Division Multiple Access. Frequency hop spread spectrum system, frequency hop CDMA DS and FH acquisition and synchronization. Satellite on board processing.

UnitV	**Very Small Aperture Terminal Network(VSAT)** – VSAT technologies, network configurations, multi access and networking. Network error control polling VSAT network. **Mobile Satellite Network(MSAT)-** Operating environment, MSAT network concept, CDMA MSAT re-link. Worldwide timing by satellite relay.
Text Books	
T.1	Timothy Pratt and Others, "Satellite Communications", Wiley India, 2nd edition,2010.
T.2	S. K. Raman, "Fundamentals of Satellite Communication", Pearson Education India, 2011.
Reference Books	
1	Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006
2	Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd, 2017, ISBN: 978-81-265-0833-4
Useful Links	
1	http://sdnbvc.digimat.in/nptel/courses/video/117105131/L03.html
2	http://nptel.ac.in/syllabus/117107036/

Tulsiramji Gaikwad-Patil College of Engineering and Technology
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First Year (Semester-II) M.TechElectronics (Communication) Engineering

Semester : II | **MEC21206:Advanced Wireless Communication (PE-II)**

Teaching Scheme	
Lectures	4 Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO):

Students will be able to

1. **Analyze** the optical fiber based systems with the fundamentals of wireless communication.
2. **Compare** the performance of different digital modulation techniques over wireless Channels.
3. **Design** OFDM system and data transmission through multicarrier modulation.
4. **Describe** the OFDMA system, its operation and its applications.
5. **Examine** frequency hopping in OFDMA

Course Contents

Unit I	**Review of Fundamentals of Wireless Communication:** Multipath fading, multipath channel models, and capacity of wireless channels.
Unit II	**Performances of Digital Modulation over Wireless Channels:** AGWN channels signal to noise power ratio and bit/symbol energy, error probability for BPSK, QPSK, MPSK, MPAM, MQAM- their comparison
Unit III	**Multicarrier Modulation:** Data transmission using multiple carriers, multicarrier modulation with overlapping sub-channels, mitigation of subcarrier fading, discrete implementation of multicarrier modulation, challenges in multicarrier systems.
Unit IV	**Introduction to Wireless OFDM:** OFDM principles, system model, generation of sub-carrier using IFFT, guard time, cyclic extension, windowing, OFDM parameters, OFDM signal processing, coherent and differential detection.
Unit V	**OFDMA:** frequency hopping in OFDMA, difference between OFDMA and MC-CDMA, OFDMA system description-channel coding, frequency synchronization, initial modulation timing and frequency offset synchronization accuracy, random frequency hopping operation, applications of OFDMA.

Text Books

T.1	Goldsmith, Wireless Communications, Cambridge Univ. Press, 2005
T.2	R. Vannee, R. Prasad, OFDM for Wireless Multimedia Communication, Artech House, 2000

Reference Books

R.1	M. Engels, Wireless OFDM systems, Klumer Academic Publishers, 2002

Useful Links

1	https://www.youtube.com/watch?v=xlkLmNwiU-M
2	https://archive.nptel.ac.in/courses/108/106/106106167/

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First Year (Semester-II) M.TechElectronics (Communication) Engineering

Semester : II | **MEC21207:Research Methodology**

Teaching Scheme	
Lectures	4 Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO):

Students will be able to

1. **Formulate** research problem.
2. **Analyze** literature review and find research gaps to finalize research objectives.
3. **Identify** the need of Research Design/Plan
4. **Apply** basic data analytics techniques, probability distribution and linear regression.
5. **Identify** the need of Report Writing

Course Contents

UnitI	**Research Foundation** What is Research, Objectives of Research, Types of Research, Scientific Research, Research and Theory, Conceptual and theoretical Models, Philosophy of research, Physical, psychological health and research.
UnitII	**Review of Literature** Need for Reviewing Literature, What to Review and for what purpose, Literature Search Procedure, Sources of Literature, Planning of Review work, Note Taking, Library and documentation
UnitIII	**Planning of Research** The planning process, Selection of a Problem for Research, Formulation of the SelectedProblems,Hypothesis,ResearchDesignandSampling,Measurement,ResearchDesign/Plan
UnitIV	**Processing of Data and Statistical Analysis of Data** Introduction to Statistical Software, Statistical analysis of data MINITAB, SPSS, Measures of Relationship, Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, Questioners Preparation and Presentation Skills, Application Orientation in Research.
UnitV	**Report and Thesis writing** Types of Reports, Planning of Report Writing, Research Report Format, Principles of Writing, Data and Data Analysis Reporting in a Thesis, Use of Endnote, Language Proficiency, Citations and Plagiarism, Bibliography, API, appendix, table, Observations arrangement, Preparation of type scriptandlay-out of thesis, Use of LATEX Indexing of Journals, Impact factor and social Media for Researchers.

Text Books	
T.1	Research Methodology: Methods and Techniques by C.R.Kothari, New Age InternationalPublishers,ISBN:81-224-1522-9
T.2	StatisticalMethodsforResearchWorkersbyFisherR.A.,CosmoPublications,New Delhi ISBN:81-307-0128-6
T.3	Research Methodology: Methods and Techniques by C.R. Kothari,NewAge International Publishers, ISBN:81-224-1522-9
Reference Books	
R.1	DesignandAnalysisofExperimentsbyMontogomeryD.C.(2001),JohnWiley,ISBN: 0471260088
R.2	Methodology of Research in Social Sciences by O.R. Krishnaswamy and M. Rangnatham Himalaya publication House, 2005, ISBN: 8184880936
Useful Links	
1	https://nptel.ac.in/courses/121/106/121106014/
2	https://nptel.ac.in/courses/108/108/108108078/

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First Year (Semester-II) M.Tech.Electronics (Communication) Engineering

Semester : II | **MEC21208:Optical Communication System Lab**

Teaching Scheme		Examination Scheme	
Practical	2Hrs/week	**CA**	25 Marks
Total Credit	1	**ESE**	25 Marks
		Total	50 Marks
		Duration of ESE:02 Hrs 00 Min.	

Course Outcomes(CO):

Students will be able to

1	**Analyze** the optical fiber based systems with application .
2	**Design** optical fiber based networks and Wavelength rerouting algorithms.
3	**Integrate** the emerging research areas in the field of sensor networks after successful completion of this course.
4	**Examine** MAC protocols used for different communication standards used in WSN.
5	**Evaluate** new protocols for WSN and WDM network.

Sr.No.	List of Experiments	CO
1	Implement WDM optical networks	CO1
2	Analyze WDM networks.	CO1
3	Examine the working of RWA algorithms	CO2
4	Perform working of Optical Amplifier	CO2
5	Verify multichannel amplification using EDFA	CO2
6	Demonstrate working of Virtual topology	CO3
7	Evaluate multicast routing multicasting node analyze.	CO3
8	Implement MAC protocols used for different communication standards in WSN	CO4
9	Perform the PON architectures.	CO5
10	Implement the Statistical dimensioning model.	CO5

Text Books

T.1	John M. Senior, "Optical fiber communication", Pearson edition, 2000
T.2	Rajiv Ramswami and K. N. Sivarajan, "Optical Networks", Morgon Kauffman Publishers, 2000.

Reference Books

R.1	Optical Communication By Barry Elliot Publication date: May 2021
R.2	Optical Communication Systems: Fundamentals, Techniques and Applications BY Karla P. Boyd

Useful Links

1	https://nptel.ac.in/courses/117/101/117101002/
2	https://nptel.ac.in/courses/108/106/108106167/

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