Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)

Scheme of Instructions and Syllabus

Scheme of Instructions for First Year M. Tech. Programme in Electronics (Communication) Engineering

Semester – II (w.e.f.: AY 2021-22)

Sr.	Course Category	CourseCode	Course Title	L	T	P	Contact Hrs/ week	Credits	Exam Scheme				
									CT - 1	CT - 2	TA / CA	ESE	TOTAL
1.	PCC	MEC 1201	Optical Communication System	3	-	-	3	3	15	15	10	60	100
2.	PCC	MEC 1202	Smart Antenna	3	-	-	3	3	15	15	10	60	100
3.	PEC	MEC1203-6*	Professional Elective - III	3	-	-	3	3	15	15	10	60	100
4.	PEC	MEC1207-10*	Professional Elective – IV	3	-	-	3	3	15	15	10	60	100
5.	PCC	MEC 1211	Optical Communication System Lab	-	-	2	2	1	-	-	25	25	50
6.	PCC	MEC 1212	Smart Antenna Lab	-	-	2	2	1	-	-	25	25	50
7.	FC	MEC 1213	Research Methodology	2	-	-	2	2	-	-	25	25	50
8.	PCC	MEC1214	Code Composer Studio Lab	-	-	4	4	2	-	-	25	25	50
9.	MCC	MAU 1202	Research Paper Writing	2	-	-	2	Audit	-	-	-	-	-
			Total	16	-	08	22	18	60	60	115	315	600

L- Lecture T-Tutorial P-Practical CT1- Class Test 1 CT2- Class Test 2 TA/CA- Teacher Assessment / Continuous Assessment

ESE- End Semester Examination (For Laboratory: End Semester Performance)

***-Indicates out of the 04 course code each student has to select any one Professional Elective.**

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Program: M. Tech. Electronics (Communication) Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1201	Optical Communication System	3	-	-	3

Course Objectives:

1.	Students will describe the concept of wavelength division multiplexing in networks and importance of routing and wave assignment and maximizing the number of optical connections with the help of RWA.
2.	Students will analyze the concept of wavelength conversion, and the process of amplification in optical communication to understand the requirement of amplification to get the desired output.
3.	Students will analyze needs of virtual topology and the problems accrue in designing virtual topology and optical multicasting.
4.	Students will able to understand how to manage the network and their different functions. And wavelength division multiplexing schemes.
5.	Students will get Identify burst switching protocol and design the passive optical network architecture.

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

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MEC1201.1	**Analyze** the optical fiber based systems with application	PO1,PO2,PO3	4	9	-
MEC1201.2	**Design** optical fiber based networks and Wavelength rerouting algorithms.	PO1,PO2,PO3	6	9	-
MEC1201.3	**Integrate** the emerging research areas in the field of sensor networks after successful completion of this course.	PO1,PO2,PO3	4	9	-
MEC1201.4	**Examine** various MAC protocols used for different communication standards used in WSN	PO1,PO2,PO3	3	9	-
MEC1201.5	**Evaluate** new protocols for WSN and WDM network.	PO1,PO2,PO3	5	9	-

CO-PO Mapping:

PO → / CO ↓	PO1	PO2	PO3
CO1	3	3	2
CO2	3	3	3
CO3	2	3	2
CO4	3	2	2
CO5	3	3	3
Average	3	3	2

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Program: M. Tech.Electronics (Communication) Engineering						
Semester	**Course Code**	**Name of Course**	**L**	**T**	**P**	**Credits**
II	MCE1202	Smart Antenna	3	-	-	3
Pre-Requisites: Antenna Wave Propagation						
Course Objectives:						
1.	Students will able to explain the antenna fundamental concepts					
2.	Students will able to analyze smart arrays.					
3	Students will able to utilize Beam Space Processing Techniques for smart antenna					
4.	Students will able to assess various adaptive processing techniques for smart antenna					
5.	Students will able to categorize Channel Characterization					
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, Beamsteered Arrays, Circular Arrays, Fixed Beam and Sectorized Arrays. Sidelobe Cancellors . Retrodirective Arrays.					
Unit III	**Narrowband Processing:** Signal Model, Steering Vector Representation, Conventional Beamformer, Source in Look Direction, Directional Interference, Random Noise Environment, Signal-to-Noise Ratio, 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 Squares Algorithm, Gradient Estimate, Covariance of Gradient, Convergence of Weight Vector, Weight Covariance Matrix, Transient Behavior of Weight Covariance Matrix, Excess Mean Square Error, Misadjustment, Normalized Least Mean Squares Algorithm, Constrained Least Mean Squares Algorithm					
Unit V	**Channel Characterization:** Channel Impulse Response, Slow Fading, Fast Fading, Fast Fading Modeling, Spreading , Channel Equalization. Methods for Optimizing the Location of Base Stations for Indoor Wireless Communication, Identification and Elimination of Multipath Effects, Signal Enhancement in Multiuser.					

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	https://youtu.be/9RIM-aBbUBc
2	https://youtu.be/pE_FsnHtTxc
3	https://youtu.be/95MfBLjrHsU

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MCE1202.1	**Analyze** Fundamental Concepts of Wire Antennas and Microstrip Antennas	PO1,PO2,PO3	4	9	-
MCE1202.2	**Design** the concept of Array Antenna Fundamentals.	PO1,PO2,PO3	6	9	-
MCE1202.3	**Integrate** the knowledge of Narrowband Processing.	PO1,PO2,PO3	4	9	-
MCE1202.4	**Examine** the properties of Adaptive Processing	PO1,PO2,PO3	3	9	-
MCE1202.5	**Evaluate** concept of Channel Characterization	PO1,PO2,PO3	5	9	-

CO-PO Mapping:

PO → / CO ↓	PO1	PO2	PO3
CO1	3	3	3
CO2	2	3	3
CO3	3	2	3
CO4	3	3	2
CO5	3	2	2
Average	3	3	3

Assessment Pattern(with revised Bloom's Taxonomy)

Cognitive Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	3	12
Analyze	5	5	3	24
Evaluate	5	5	4	12
Create	-	-	-	12
TOTAL	15	15	10	60

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MCE1202	Smart Antenna	3	-	-	3

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
1.	Design and analyze various antenna.	AICTE Model Curriculum (autonomous institute),NPTEL	Students shall able to design and implement various antenna as per needs of industries.

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1208	Digital Image And Video Processing	3	-	-	3

Pre-Requisites: Digital Image Processing

Course Objectives:

1. Provide deeper knowledge of theoretically demanding methods of image data processing and of their applications.
2. Understand the modification of image and filtering out while processing and the techniques apply for proper processing of image.
3. To understand different types of compression&segmentation processes for image and distinguish the more effective for the processing of image.
4. To know the video technology from analog color TV systems to digital video systems & understand how video signal is sampled and filtering operations performin video processing.
5. To learn different methodologies for 2D motion estimation, various coding used in video Processing.

Course Contents

Unit I	**Fundamentals of Image Processing and Image Transforms:** Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing, Need for transform, image transforms, 2 D Discrete Fourier transform, Walsh transform, Hadamard transform, Haar transform, slant transform, KL transform, Radon transform, comparison of different image transforms.
Unit II	**Image Enhancement:** Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothingspatial filters, Sharpening spatial filters. Frequency domain methods, image smoothing, image sharpening, Selective filtering. **Image Restoration:** Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques.
Unit III	**Image Segmentation**: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation, Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking.**Image Compression:** Need for image compression, Redundancy in images &Classification, image compression scheme & Classification, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.
Unit IV	**Basic Steps of Video Processing:**Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Videosignals, Filtering operations.
Unit V	**2-D Motion Estimation:**Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

Text Books

T.1	Digital Image Processing- 2nd edition 2002 R.C. Gonzalez & R.E. Woods Addison Wesley/Pearson education publication
T.2	Fundamentals of Digital Image processing - 2nd edition. A. K. Jain PHI publication

T.3	Fundamentals of Digital Image Processing- A. K. Jain. Pearson Education
Reference Books	
R.1	Digital Image processing using MATLAB 2004 R.C. Gonzalez & R.E. Woods Addison Wesley/Pearson
R..2	Digital Image processing 3rd Edition 2004 William K. Pratt John Wiley
R.3	Digital Image Processing- Pratt William John Wiley & Sons
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104139/
2	http://nptel.ac.in/courses/117107095
3	http://nptel.ac.in/courses/117103064

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MEC1208.1	**Examine** the fundamentals of Digital image processing	PO1,PO2,PO3	3	9	-
MEC1208.2	**Determine** the mathematical implementation of enhancement &restoration for image processing.	PO1,PO2,PO3	3	9	-
MEC1208.3	**Apply** solutions of segmentation & compression for general image processing.	PO1,PO2,PO3	3	9	-
MEC1208.4	**Analyze** basic Steps of Video Processing for image Formation models.	PO1,PO2,PO3	4	9	-
MEC1208.5	**Evaluate** 2-D Motion Estimation of video processing.	PO1,PO2,PO3	5	9	-

CO-PO Mapping

PO → / CO ↓	PO1	PO2	PO3
CO1	3	2	2
CO2	3	3	3
CO3	3	2	3
CO4	2	3	3
CO5	3	3	3
Avg	**3**	**3**	**3**

Assessment Pattern**(with revised Bloom's Taxonomy)**

Cognitive Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	3	36
Analyze	5	5	3	12
Evaluate	5	5	4	12
Create				
TOTAL	15	15	10	60

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1208	Digital Image And Video Processing	3	-	-	3

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
V	Color Image Processing: Color Fundamentals, color models, Pseudo color image processing, Basics of full color image processing, Color transformations, Color segmentation, Noise in color images,(Modifications proposed with respect to the conventional gray ,black, white images)	AICTE model curriculum	To strengthen the skills in image processing and elaborate the concept of image processing by adding color image professing concept. To understands how color image is processes.

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1206	IOT &Application	3	-	-	3

Pre-Requisites:N.A.

Course Objectives:

1.	To Understand the Architectural Overview of IoT
2.	To Understand the IoT Reference Architecture and RealWorld Design Constraints
3.	To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)
4.	Introduce concepts transport layer in detail.
5.	Student will study the services and security in IOT protocol.

Course Contents

Unit I	IoT- Understanding IoT fundamentals and Architectural Overview– Building an architecture. Main design principles and needed capabilities. An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways. Local and wide area networking. Data management. Business processes in IoT. Everything as a Service (XaaS). M2M and IoT Analytics. Knowledge Management
Unit II	PHY/MAC Layer(3GPP MTC. IEEE 802.11. IEEE 802.15). Wireless HART.Z Wave. Bluetooth Low Energy. Zigbee Smart Energy. DASH7 - Network Layer-IPv4. IPv6. 6LoWPAN
Unit III	Transport Layer (TCP. MPTCP. UDP. DCCP. SCTP)-(TLS. DTLS) – Session Layer HTTP. CoAP. XMPP. AMQP. MQTT
Unit IV	Service Layer -oneM2M. ETSI M2M. OMA. BBF – Security in IoT Protocols – MAC 802.15.4 . 6LoWPAN. RPL. Application Layer
Unit V	IoT Applications- Intelligent Traffic systems (case study). Smart Parking (case study). Smart water management (case study).

Text Books

T.1	Jan Holler. VlasiosTsiatsis. Catherine Mulligan. Stefan Avesand. StamatisKarnouskos. David Boyle. "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence". 1st Edition. Academic Press. 2014.
T.2	Peter Waher. "Learning Internet of Things". PACKT publishing. BIRMINGHAM – MUMBAI

Reference Books

R.1	Bernd Scholz-Reiter. Florian Michahelles. "Architecting the Internet of Things". ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2. Springer
R.2	Daniel Minoli. "Building the Internet of Things with IPv6 and MIPv6: The Evolving

Useful Links

1	https://onlinecourses.nptel.ac.in/noc21_cs17
2	https://nptel.ac.in/courses/108/108/108108098/
3	https://nptel.ac.in/courses/108/108/108108123/

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MEC1203.1	Develop **understanding** of IOT in detail.	PO1,PO2	3	9	-
MEC1203.2	**Design** fundaments of reference architecture of IOT.	PO1,PO2,PO3	5	9	-
MEC1203.3	**Analyze** different types of IOT protocol.	PO1,PO2,PO3	4	9	-
MEC1203.4	**Analyze** the concept of transport layer.	PO1,PO2,PO3	4	9	-
MEC1203.5	**Evaluate** the performance of services and security in IOT.	PO1,PO2,PO3	5	9	-

CO-PO Mapping

PO → / CO ↓	PO1	PO2	PO3
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	3	2	3
CO5	3	3	2
Avg	**3**	**3**	**2**

Assessment Pattern(with revised Bloom's Taxonomy)

Cognitive Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	4	4	2	-
Apply	5	6	3	20
Analyze	6	5	5	20
Evaluate	-	-	-	20
Create	-	-	-	-
TOTAL	15	15	10	60

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1206	IOT & application	3	-	-	3

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
1.	NEW SUBJECT	Industrial feedback. AICET curriculum SRM university.	To strengthen the skills of student with the latest technologies and relevant knowledge about IOT and security and services. student were competent in today's need and requirement of industries.

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1211	Optical Communication system Lab	-	-	2	1

Course Objectives:

1.	Students will understand the concept of wavelength division multiplexing in networks and importance of routing and wave assignment and maximizing the number of optical connections with the help of RWA.
2.	Students will analyze the concept of wavelength conversion, and the process of amplification in optical communication to understand the requirement of amplification to get the desired output.
3.	Students will analyze needs of virtual topology and the problems accrue in designing virtual topology and optical multicasting.
4.	Students will able to understand how to manage the network and their different functions. And wavelength division multiplexing schemes.
5.	Students will get the knowledge of burst switching protocol and understand the passive optical network architecture.

	Course Contents	CO
1	To study the WDM optical networks	CO1
2	Analyze the working of RWA algorithms	CO2
3	To study and working of Optical Amplifier	CO2
4	To study the multichannel amplification using EDFA	CO2
5	To study the working of Virtual topology	CO3
6	Analyze multicast routing multicasting node analyze.	CO3
7	Analyze WDM networks.	CO1
8	To study the working of Burst switching protocols.	CO5
9	To study the PON architectures.	CO5
10	Analysis 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	John M. Senior, "Optical fiber communication", Pearson edition, 2000.
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/

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MEC1211.1	**Analyze** the optical fiber based systems with application	PO1,PO2,PO3	4	-	4

MEC1211.2	**Design** optical fiber based networks and Wavelength rerouting algorithms.	PO1,PO2,PO3	6	-	4
MEC1211.3	**Integrate** the emerging research areas in the field of sensor networks after successful completion of this course.	PO1,PO2,PO3	4	-	4
MEC1211.4	**Examine** various MAC protocols used for different communication standards used in WSN	PO1,PO2,PO3	3	-	2
MEC1211.5	**Evaluate** new protocols for WSN and WDM network.	PO1,PO2,PO3	5	-	6

CO-PO Mapping:

PO → / CO ↓	PO1	PO2	PO3
CO1	3	3	2
CO2	3	3	3
CO3	2	3	2
CO4	3	2	2
CO5	3	3	3
Average	3	3	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Cognitive Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	3	12
Analyze	5	5	3	24
Evaluate	5	5	4	12
Create				24
TOTAL	15	15	10	60

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1211	Optical Communication system Lab	-	-	2	1

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
1.	No changes	Syllabus taken as per AICET model curriculum	The entire practical in given syllabus is ideally fulfil the requirements of given subject; there is no requirement for any changes.

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Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1212	Smart Antennas Lab	-	-	2	1

Pre-Requisites: Antenna Wave Propagation

Course Objectives:

1.	Students will able to design and study parameters of the advanced antennas
2.	Students will able to analyze arrays.
3	Students will able to examine beam forming process.
4.	Students will able to study and evaluate the parameters of adaptive processing techniques
5.	Students will able to categorize Channel Characterization

	Course Contents	CO
1	To study and evaluate parameters of dipole Antenna..	CO1
2	Design and study parameters of MIMO antenna.	CO1
3	Design and analyze parameters of FIFA antenna.	CO1
4	Design and analyze the parameters of phase array	CO2
5	To study and examine the parameter ofNull Steering Beamformer.	CO3
6	To study and analyze the parameters of Constrained Beam former.	CO3
7	To study and evaluate the parameters Switched beam systems.	CO4
8	To study and analyze the parameters of adaptive array systems.	CO4
9	To study and examine the Methods for Optimizing the Location of Base Stations for Indoor Wireless Communication.	CO5
10	To study the Identification and Elimination of Multipath Effects	CO5

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

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

Useful Links

1	https://youtu.be/xsEysRRWPCA
2	https://youtu.be/UNkvTicN7c0
3	https://youtu.be/UJP89rnqCG4

	Course Outcomes	PO/PSO	CL	Class Sessions	Lab Sessions
MEC1212.1	Design and study parameters of theadvanced antennas	PO1,PO2,PO3	6	-	8

MEC1212.2	Analyze arrays.	PO1,PO2,PO3	4	-	2
MEC1212.3	Examine beamforming process.	PO1,PO2,PO3	4	-	6
MEC1212.4	Study and evaluate the parameters of adaptive processing techniques	PO1,PO2,PO3	4	-	4
MEC1212.5	Categorize Channel Characterization	PO1,PO2,PO3	4	-	8

CO-PO Mapping:

PO → / CO ↓	PO1	PO2	PO3
CO1	3	3	3
CO2	2	3	3
CO3	3	2	3
CO4	3	3	2
CO5	3	2	3
Average	3	3	3

Assessment Pattern**(with revised Bloom's Taxonomy)**

Knowledge Level	CA	ESE
Remember	-	-
Understand	-	-
Apply	8	8
Analyze	7	7
Evaluate	7	7
Create	3	3
TOTAL	25	25

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Program: M. Tech Electronics (Communication) Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1212	Smart Antennas Lab	-	-	2	1

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
1.	To study and Analysis of micro strip patches arrays and feed networks.	AICTE model curriculum (autonomous institute) industry feedback	To analyse the antennas like micro strip practically to strengthen the practical knowledge of the students.
2.	**To study and analysis** smart antenna parameters	AICTE model curriculum (autonomous institute)	To analyse and evaluate the parameters of the smart antennas.

HOD
Department of Electronics & Comm
Tulsiramji Gaikwad - Patil College
of Engineering & Technology Nagpur

Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur

Principal
Tulsiramji Gaikwad-Patil College of
Engineering & Technology,
Nagpur

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
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Program: M. Tech Electronics (Communication) Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
II	MEC1214	Code Compressor Studio Lab	-	-	2	1

Course Objectives:

1. Generate & Perform different operations on discrete time signals and systems.
2. Analyze and implement digital systems using the Discrete Fourier Transform and Fast Fourier Transform (FFT) techniques using MATLAB and signal processing toolboxes.
3. Use Z transforms to analyze a digital system finding the region of convergence using MATLAB and signal processing toolboxes.
4. Design and Implement digital FIR and IIR filters.
5. Design Up converter, down converter & Sample rate converter.

	Course Contents	CO
1	Computation of N- Point DFT of a Given Sequence 85	CO1
2	Implementation of FFT of Given Sequence 90	CO2
3	Power Spectrum	CO2
4	Implementation of LP FIR Filter for Given Sequence & Implementation of HP FIR Filter for Given Sequence	CO2
5	Implementation of LP IIR Filter for Given Sequence & Implementation of HP IIR Filter for Given Sequence	CO3
6	Generation of Sinusoidal Signal Through Filtering	CO3
7	Generation of DTMF Signals	CO4
8	Implementation of Decimation Process	CO4
9	Implementation of Interpolation Process	CO5
10	Impulse Response of First Order and Second Order Systems	CO5

Text Books

T.1	"Digital Signal Processing" by Proakis and Manolokis
T.2	"Digital Signal Processing" by S K Mitra

Reference Books

R.1	"Theory and Application of Digital Signal Processing" by Rabinar L R and Gold B
R.2	"Introduction to Digital Signal Processing" by Johnson

Useful Links

1	https://nptel.ac.in/courses/117/101/117101002/

2	https://nptel.ac.in/courses/108/106/108106167/				
	Course Outcomes	**PO/PSO**	**CL**	**Class Sessions**	**Lab Sessions**
MEC1214.1	Generate & Perform different operations on discrete time signals and systems.	PO1,PO2,PO3	4	-	4
MEC1214.2	Generate & Perform different operations on discrete time signals and systems.	PO1,PO2,PO3	6	-	4
MEC1214.3	2 Analyze and implement digital systems using the Discrete Fourier Transform and Fast Fourier Transform (FFT) techniques using MATLAB and signal processing toolboxes.	PO1,PO2,PO3	4	-	4
MEC1214.4	3. Use Z transforms to analyze a digital system finding the region of convergence using MATLAB and signal processing toolboxes.	PO1,PO2,PO3	3	-	2
MEC1214.5	4 Design and Implement digital FIR and IIR filters.	PO1,PO2,PO3	5	-	6

CO-PO Mapping:

PO → / CO ↓	**PO1**	**PO2**	**PO3**
CO1	3	3	2
CO2	3	3	3
CO3	2	3	2
CO4	3	2	2
CO5	3	3	3
Average	3	3	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Cognitive Level	**CT 1**	**CT 2**	**TA**	**ESE**
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	3	12
Analyze	5	5	3	24
Evaluate	5	5	4	12
Create				24
TOTAL	15	15	10	60

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Program: M. Tech Electronics (Communication) Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
II	**MEC1214**	Code Compressor Studio Lab	-	-	2	1

Summary of Revisions in the Contents

Unit No.	Modifications Proposed	Source of collection of proposed content	Reason
1.	New Lab	New	The entire practical in given syllabus is ideally fulfil the requirements of given subject; there is no requirement for any changes.

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College Qf Engineering
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Principal
Tulsiramji Gaikwad-Patil College of
Engineering & Technology,
Nagpur