`

PAAVAI ENGINEERING COLLEGE, NAMAKKAL-637018

(Autonomous)

B.E- ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS-2016

CURRICULUM

(CHOISE BASED CREDIT SYSTEM)

SEMESTER VII

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	EC16701	Embedded Systems	3	0	0	3
2	PC	EC16702	Microwave Engineering	3	0	0	3
3	PC	EC16703	Optical Communication	3	0	0	3
4	PE	EC16***	Programme Elective III	3	0	0	3
5	PE	EC16***	Programme Elective IV	3	0	0	3
6	OE	EC16***	Open Elective II	3	0	0	3
Practical							
7	PC	EC16704	Embedded Systems Laboratory	0	0	4	2
8	PC	EC16705	Microwave, Optical and Communication Laboratory	0	0	4	2
9	EE	EC16706	Project Work (Phase I)	0	0	4	2
			Total	**18**	**0**	**12**	**24**

SEMESTER VIII

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	EC16801	Wireless Networks	4	0	0	4
2	PE	EC16***	Programme Elective V	3	0	0	3
3	PE	EC16***	Programme Elective VI	3	0	0	3
Practical							
4	EE	EC16802	Project Work (Phase II)	0	0	12	6
			Total	**10**	**0**	**12**	**16**

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PROGRAMME ELECTIVE III

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PE	EC16351	Digital Image Processing	3	0	0	3
2	PE	EC16352	Speech Processing	3	0	0	3
3	PE	EC16353	Electromagnetic Interference and Compatibility	3	0	0	3
4	PE	EC16354	Telecommunication System modeling and simulation	3	0	0	3

PROGRAMME ELECTIVE IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PE	EC16451	Television Signal Processing and Display Systems	3	0	0	3
2	PE	EC16452	Space Time Communication	3	0	0	3
3	PE	EC16453	Web Technology	3	0	0	3
4	PE	EC16454	Biosignal Processing	3	0	0	3

PROGRAMME ELECTIVE V

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PE	EC16551	Optoelectronic Devices	3	0	0	3
2	PE	EC16552	Micro-Electro-Mechanical Systems	3	0	0	3
3	PE	EC16553	Mobile Operating Systems	3	0	0	3
4	PE	EC16554	Multimedia Compression and Communication	3	0	0	3

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PROGRAMME ELECTIVE VI

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PE	EC16651	Medical Electronics	3	0	0	3
2	PE	EC16652	Cellular and Mobile Communication	3	0	0	3
3	PE	EC16653	RF Microelectronics	3	0	0	3
4	PE	EC16654	Virtual Instrumentation	3	0	0	3

OPEN ELECTIVE II

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	OE	EC16904	Radar and Navigational aids	3	0	0	3
2	OE	EC16905	PLC and DCS	3	0	0	3
3	OE	EC16906	Nano Scale Devices	3	0	0	3
4	OE	EC16907	Automotive Electrical and Electronics System	3	0	0	3

EC16701 EMBEDDED SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- Study the overview of embedded system Architecture
- learn various embedded communication protocols
- be exposed to the basic concepts of real time Operating system.
- learn the architecture and programming of ARM processor.
- know the concept of embedded applications.

UNIT I ARCHITECTURE OF EMBEDDED SYSTEMS 9

Embedded Systems-Specifications of Embedded Systems-Recent trends in Embedded Systems-Hardware Architecture-Software Architecture-Communication Software-Process of generation of executable image-development/testing tools.

UNIT II PROCESS OF EMBEDDED SYSTEM DEVELOPMENT 9

.Development Process-Requirements Engineering-Design-Implementation-Integration and Testing-Packaging-Configuration Management-Managing Embedded System Development Project.

UNIT III REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel-task and task Scheduler-Interrupt Service Routines-Semaphores- Mutex Mailboxes-Message Queues-Event Registers-Pipes-Signals Timers-Memory Management- Priority Inversion Problem.

UNIT IV SOFTWARE DEVELOPMENT TOOLS 9

Software Development environment-IDE, assembler, compiler, linker, simulator, debugger, in-circuit simulator, Target Hardware Debugging, Need for Hardware-Software Partitioning and Co-Design. Overview of UML, Scope of UML modelling.

UNIT V APPLICATION OF EMBEDDED SYSTEMS 9

Data compressor-Alarm Clock-Audio player-Software modem-Digital still camera-Telephone answering machine-Engine control unit-Video accelerator.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- describe the hardware and software architectures of Embedded Systems.
- introduce the devices and buses used for Embedded Networking
- interpret the concepts of a Real Time Operating System

- elucidate the special features of ARM architecture
- model real-time applications using embedded-system concepts

TEXT BOOKS

1. K.V.K.K. Prasad "Embedded /Real-Time Systems: Concepts, Design and Programming" Dreamtech, Wiley 2003.
2. Raj Kamal, "Embedded Systems Architecture Programming and Design", Second Edition, MH, 2010

REFERENCES

1. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developer 's Guide and Optimizing system Software", Morgan Kaufmann Publishers, Elsevier, 2004.
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third EditioCengage learning,2012
3. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	2	-	-	-	-	-	-	-	-	2	1
CO2	3	1	2	2	-	-	-	-	-	-	-	-	2	1
CO3	3	1	1	2	-	-	-	-	-	-	-	-	1	1
CO4	3	1	1	2	3	-	-	-	-	-	-	-	1	1
CO5	3	1	1	2	2	-	-	-	-	-	-	-	1	1

EC16702 MICROWAVE ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on fundamentals of Microwave components.
- understand Microwave sources and amplifiers.
- study about Microwave Semiconductor devices.
- learn with the concepts of Microwave Integrated Circuits
- know the concepts of Microwave Measurements

UNIT I MICROWAVE COMPONENTS 9

Microwave Frequencies - S Parameters: Properties, - Passive devices: Waveguide corners - bends and twists, Waveguide Tees E, H and Magic Tees, Rat-race Coupler, Directional Couplers, Two Hole Directional Couplers, Circulators and Isolators - S Matrix of Waveguide Tees and Directional Coupler.

UNIT II MICROWAVE LINEAR-BEAM TUBES & CROSSED-FIELD TUBES 9

Klystrons - Reentrant Cavities-Velocity Modulation Process - Bunching Process, Reflex Klystrons Velocity Modulation, Helix Traveling Wave Tubes – Slow Wave structures Amplification Process - Convection Current- Axial Electric Field - Wave Modes - Gain Consideration, Microwave Crossed Field Tubes -Cylindrical Magnetron

UNIT III MICROWAVE SEMICONDUCTOR DEVICES 9

Transferred Electron Devices: Gunn Effect Diodes - Ridely-Watkins-Hilsum Theory, Modes of Operation. Avalanche Transit-Time Devices: Read Diode - IMPATT Diodes – TRAPATT Diodes - Parametric Amplifiers - Non-linear Reactance and Manley-Rowe Power Relations.

UNIT IV MICROWAVE INTEGRATED CIRCUITS 9

Introduction -micro strip lines-characteristic impedance-losses-quality factor Q, parallel strip lines Distributed Parameters-Attenuation, coplanar strip Lines, shielded strip Lines, monolithic microwave Integrated circuits-Introduction-Materials-Substrate Materials-Conductor Materials-Dielectric Materials Resistive Materials-Monolithic Microwave Integrated-circuit growth-MMICF abirication Techniques Fabrication Examples.

UNIT V MICROWAVE MEASUREMENTS AND APPLICATIONS 9

SWR Measurement - Power Measurement – Frequency Measurement - Impedance Measurement - Insertion Loss and Attenuation Measurements - Dielectric Constant Measurement of a Solid Using Waveguide Method - Industrial Applications of microwaves.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- describe the various waveguide components.

- classify the microwave tubes (Linear beam tubes and Crossed field tubes)
- discuss the various microwave semiconductor device Performance.
- design of waveguide components and microwave transmission lines for a given set of parameters.
- identify the measurement techniques for different parameters like VSWR, impedance, frequency, power of microwave sources and loads. .

TEXT BOOKS

1. Samuel Y.Liao - "Microwave Devices and Circuits" - Pearson EducationInc.2011
2. Annapurna Das and Sisir K Das - "Microwave Engineering" - Tata McGraw Hill

REFERENCE BOOK

1. Reinhold Ludwig and Gene Bogdanov- "RF Circuit Design: Theory and Applications"-Pearson Education Inc.2011
2. Robert E Colin – "Foundations for Microwavw Engineering"- John Wiley & Sons Inc – 2005.
3. Thomas H Lee – Planar Microwavw Engineering: A Practical Guide to Theory- Measurements and Circuits"- Cambridge University Press- 2004.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	2	-	-	-	-	-	-	-	-	-	1	1
CO2	3	-	2	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	2	-	-	-	-	-	-	-	-	-	1	1
CO4	3	-	2	-	2	-	-	-	-	-	-	-	1	1
CO5	3	-	2	-	2	-	-	-	-	-	-	-	1	1

EC16703 OPTICAL COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain the knowledge about optical fiber sources and transmission techniques
- learn the principle of light propagation through optical fibers
- understand signal distortion mechanisms in the fiber
- study optical transmitters and receivers for fiber /free space links
- acquire optical network concepts and components involved.

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Evolution of fiber optic System-Element of an Optical Fiber Transmission Link-Total internal reflection- Acceptance Angle-Numerical Aperture-Skew Rays Ray Optics-Optical Fiber Modes and Configurations-Mode theory of Circular Wave Guides-Overview of Modes-Key Modal ConceptsLinearly Polarized Modes-Single Mode fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9

Attenuation-Absorption Losses-Scattering Losses-Bending Losses-Core and Cladding Losses- Signal Distortion in Optical Wave Guides-Information Capacity Determination-Group Delay- Material Dispersion-Wave Guide Dispersion-Signal distortion in SM fibers-Polarization Mode dispersionIntermodal dispersion-Pulse Broadening in GI fibers-Mode Coupling, Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

Direct and indirect Band gap materials-LED Structures-Light Source Materials-Quantum efficiency and LED Power-Modulation of a LED-lasers Diodes-Modes and Threshold Condition-Rate Equations-External Quantum Efficiency-Resonant Frequencies-Laser Diodes Temperature Effects-Introduction to Quantum Laser-Fiber Amplifiers-Power Launching and coupling-Lensing SchemesFiber-to-Fiber Joints-Fiber splicing-Signal to Noise ratio-Detector response time.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9

Fundamental receiver operation-Pre Amplifiers-Error Sources-Receiver Configuration Probability of Error- Quantum limit. Fiber Attenuation Measurements-Dispersion Measurements-Fiber Refractive index profile Measurements-Fiber Cut-off Wave Length Measurements-Fiber Numerical Aperture Measurements-Fiber diameter measurements.

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION 9

Basic Networks: SONET / SDH-Broadcast and select WDM Networks- Wavelength Routed Networks - Non-linear effects on Network Performance-Link Power Budget-Rise time BudgetNoise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA System-Solutions-Optical CDMA-Ultra High Capacity Networks**.**

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the various optical fiber modes, configurations.

- evaluate the various signal degradation factors associated with Optical fiber.
- apply the various optical sources and optical detectors and their use in the opticalcommunication system.
- compare the fiber optic receiver and measurements.
- analyze the digital transmission and its associated parameters on system performance.

TEXT BOOKS

1. Gerd Keiser, "Optical Fiber Communication" McGraw -Hill International, 4th Edition, 2010.
2. John M.Senior, "Optical Fiber Communication", Second Edition, Pearson Education, 2007.

REFERENCES

1. Ramaswami, Sivarajan and Sasaki "Optical Networks", Morgan Kaufmann, 2009.
2. J. Senior, "Optical Communication, Principles and Practice", Prentice Hall if India, 3rd Edition, 2008.
3. .J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	1	-	-	-	-	-	-	-	-	2	1
CO2	3	1	2	2	-	-	-	-	-	-	-	-	2	1
CO3	3	1	1	1	2	-	-	-	-	-	-	-	2	1
CO4	3	1	1	1	2	-	-	-	-	-	-	-	2	1
CO5	3	1	1	2	2	-	-	-	-	-	-	-	2	1

EC16704 EMBEDDED SYSTEMS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- learn the working of ARM processor
- understand the Building Blocks of Embedded Systems
- learn the concept of memory map and memory interface
- know the characteristics of Real Time Systems

LIST OF EXPERIMENTS

1. Flashing of LEDS.
2. Interface Switches and LED's.
3. Interface LCD and Display "Hello World".
4. Interface 4*4 Matrix Pad.
5. Interfacing Seven segments and analysis the Interrupts.
6. Interfacing EPROM.
7. Interfacing RTC.
8. Images read and write in GLCD.
9. Interfacing stepper motor with ARM.
10. Interfacing DC Motor with ARM.

TOTAL PERIODS 60

COURSE OUTCOMES

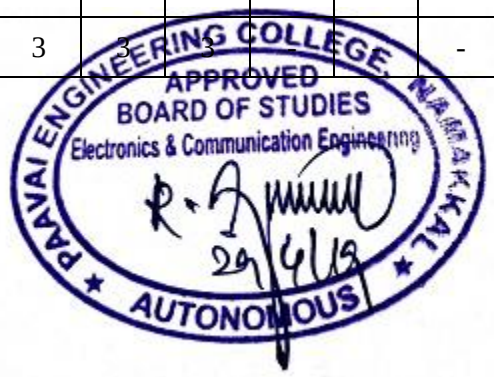
Upon the completion of the course, the students will be able to

- write programs in ARM for a specific Application
- interface memory and Write programs related to memory operations
- analyze the performance of interrupt
- write programmes for interfacing keyboard, display, motor.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	-	3	-	-	-	-	2	3	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	-	-	3	-	-	-	-	2	-	3	3
CO4	3	3	3	3	-	-	-	-	-	-	2	3	3	3



EC16705 MICROWAVE, OPTICAL AND COMMUNICATION LABORATORY **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- study the performance parameters of optical source and detector.
- become familiar with different modes.
- analyse the radiation pattern of horn and micro strip antennas.
- understand the characteristics of different microwave components.

LIST OF EXPERIMENTS

I I.OPTICAL EXPERIMENTS

1. Determination of numerical aperture for fibers and Attenuation Measurement in Fibers
2. To determine the characteristics of Photo Diode and LED
3. To establish the communication links of Analog and Digital using Fiber optic cables

II.COMMUNICATION EXPERIMENTS

1. Study of signal sampling and reconstruction
2. Study of Delta modulation and Demodulation
3. Study of FM modulator and Demodulator
4. Simulation of Error control coding schemes-Linear block codes using MATLAB
5. Simulation of signal constellations of BPSK, QPSK and QAM using MATLAB

III.MICROWAVE EXPERIMENTS

1. Radiation Pattern measurement of pyramidal Horns and MIC antennas
2. Power Measurement of microwave source
3. Study of characteristics of Gunn diode and Gunn Oscillator
4. Study of characteristics of Directional Couplers and Magic Tee

TOTAL PERIODS 60

COURSEOUTCOMES

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

- demonstrate the characteristics of Microwave sources and conventional and Micro strip antennas
- analyze the characteristics of optical source and detector. .
- demonstrate a fiber optic communication link and analyze its frequency responses.
- acquire the knowledge in modulation and demodulation scheme through implementation of DM, FM, BPSK, QPSK and QAM and apply various channel coding schemes

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	3	-	3	-	-	-		-	-		3	3
CO2	-	-	3	-	3	-	-	-		-	-		3	3
CO3	-	-	3	-	3	-	-	-		-	-		3	3
CO4	-	-	3	-	3	-	-	-		-	-		3	3

EC16706 PROJECT WORK (PHASE I) 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- gain knowledge on literature review
- categorize the requirements for the project
- develop hardware solutions for simple applications.
- learn to work in a team.

Every student will be required to undertake a suitable project work in the Department during VII semester, in consultation with the Head of the Department and the guide. Every student will have to prepare and submit the literature review and simulated output of their project at the end of the semester within the stipulated time as announced by the Institute/Department

COURSE OUTCOMES

At the end of the course, the students would be able to

- apply knowledge of basic science and engineering to Electronics and Communication engineering problems.
- analyze the requirements for the project.
- identify, formulate simple problem statements and find solutions.
- implement the hardware and test.

TOTAL PERIODS 60

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO2	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO3	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO4	3	2	3	2	3	2	1	1	2	2	3	1	3	2

EC16351 DIGITAL IMAGE PROCESSING 3 0 0 3

COURSE OBJECTIVES

The student should be made to

- gain knowledge about digital image fundamentals
- be exposed to simple image enhancement techniques
- be familiar with image restoration and segmentation techniques
- know about wavelets and image compression techniques
- learn to represent image in form of features

UNIT I DIGITAL IMAGE FUNDAMENTALS 8

Introduction-Origin-Steps in Digital Image Processing-Components-Elements of Visual Perception Image Sensing and Acquisition-Image Sampling and Quantization-Relationships between pixels colour models.

UNIT II IMAGE ENHANCEMENT 10

Spatial Domain: Gray level transformations-Histogram processing-Basics of Spatial Filtering Smoothing and Sharpening Spatial Filtering-Frequency Domain: Introduction to Fourier Transform Smoothing and Sharpening frequency domain filters-Ideal, Butterworth and Gaussian filters.

UNIT III IMAGE RESTORATION AND SEGMENTATION 9

Noise models-Mean Filters-Order Statistics-Adaptive filters-Band reject Filters-Band pass Filters Notch Filters- Optimum Notch Filtering-Inverse Filtering-Wiener filtering. Segmentation: Detection of Discontinuities-Edge Linking and Boundary Detection Region based segmentation Morphological processing-erosion and dilation**.**

UNIT IV WAVELETS AND IMAGE COMPRESSION 9

Wavelets - Sub Band Coding - Multi resolution Expansions - Compression**:** Fundamentals – Image Compression Models - Error Free Compression - Variable Length Coding – Bit Plane Coding - Lossless Predictive Coding - Lossy Compression - Lossy Predictive Coding - Compression Standards.

UNIT V IMAGE REPRESENTATION AND RECOGNITION 9

Boundary representation - Chain Code - Polygonal approximation, signature, boundary segments Boundary description - Shape number - Fourier Descriptor, moments - Regional Descriptor Topological feature, Texture- Patterns and Pattern classes - Recognition based on matching.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- elucidate the digital image fundamentals.
- apply the concepts of image enhancement techniques

- use image restoration and segmentation techniques
- analyse wavelets and image compression techniques
- .represent features of images

TEXT BOOKS

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Usig MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. William K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	-	3	-	-	-	-	-	-		3	3
CO2	3	3	3	-	3	-	-	-	-	-	-		3	3
CO3	3	3	3	-	3	-	-	-	-	-	-		3	3
CO4	3	3	3	-	3	-	-	-	-	-	-		3	3
CO5	3	3	3	-	3	-	-	-	-	-	-		3	3

EC16352 SPEECH PROCESSING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- introduce speech production and related parameters of speech
- understand the time domain methods for speech processing
- develop frequency domain techniques for estimating speech parameters
- introduce the predictive technique for speech compression.
- understand speech recognition, synthesis and speaker identification

UNIT I NATURE OF SPEECH SIGNAL 9

Speech production Mechanism-Classification of Speech-Sounds-Nature of speech Signal- Models for speech production. Speech signal processing: purpose of speech Processing- Digital models for speech Signal-Digital processing of speech Signals-Significance-Short time analysis.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters for speech-methods for extracting the Parameters-Zero Crossings- Auto correlation function-Pitch estimation.

UNIT III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9

Short time Fourier analysis-filter bank analysis-spectrographic Analysis-Format extraction-pitch Extraction-Analysis- Synthesis systems.

UNIT IV LINEAR PREDICTIVE CODING OF SPEECH 9

Formulation of linear prediction problem in time domain-solution of LPC Equations-Interpretation of Linear Prediction in auto correlation and spectral domain

UNIT V SPEECH SYNTHESIS AND ANALYSIS 9

Central analysis of speech-format and pitch Estimation-Applications of speech Processing-Speech Recognition- Speech synthesis and speaker verification.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the basics of speech production and related speech parameters.
- understand the time domain methods of speech processing
- explain the frequency domain techniques for speech parameters estimation
- learn the predictive techniques for speech compression
- .use different speech synthesis techniques

TEXT BOOKS

1. L.R.Rabiner and R.E.Schafer, "Digital processing of speech signals, Dorling Kindersley (India) Private Limited, 2011
2. J.L.Flanagan, "Speech Analysis Synthesis and Perception", 2nd Edition- Springer Verlag, 1972.

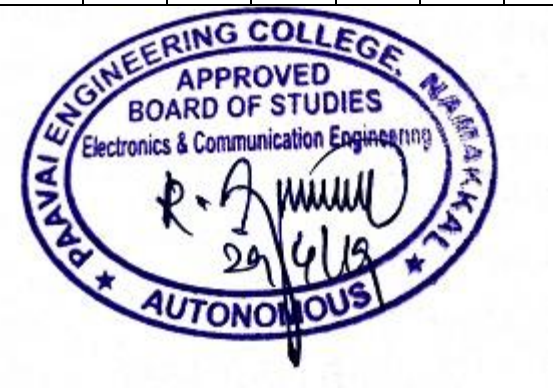
REFERENCES

1. L.Rabiner and Biling Hwang Juang, "Fundamentals of Speech recognition", Pearson Education ,2003.
2. I.H.Witten, "Principles of Computer Speech", Academic press, 1983
3. Thomas F.Quateri, "Discrete-Time Speech Processing – Principles and Practice" , Pearson Education, 2004.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	1	-	-	-	-	-	-	-	-	1	1
CO2	3	1	2	2	-	-	-	-	-	-	-	-	1	1
CO3	3	1	1	1	2	-	-	-	-	-	-	-	1	1
CO4	3	1	1	1	2	-	-	-	-	-	-	-	1	1
CO5	3	1	1	2	2	-	-	-	-	-	-	-	1	1



EC16353 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the basics of EMI and EMC Environment
- study about EMI and EMC Coupling Principles
- acquire EMI used in instrumentation system
- understand the control techniques involved in Electromagnetic Interference
- learn the electromagnetic interference specification standards and Limit

UNIT I EMI ENVIRONMENT 9

Concepts of EMI and EMC and Definitions-Sources of EMI-Celestial Electromagnetic Noise Lightning discharge- Switches Electrostatic Discharge-Electromagnetic Pulse-Electromagnetic Emission-Noise from relays and- Nonlinearities in Circuits

UNIT II EMI COUPLING PRINCIPLES 9

Capacitive Coupling-Inductive coupling- Common impedance ground Coupling-Ground Loop CouplingTransients in power supply Lines-Radiation coupling, Conduction Coupling-Common- mode and Differential mode.

UNIT III EMI MEASUREMENTS 9

Open area test site Measurements-Measurement Precautions-Open area test Site-Anechoic Chamber-TEM Reverberating TEM-GTEM Cell-Comparisons

UNIT IV EMI CONTROL TECHNIQUES 9

EMC Technology-Grounding-Shielding-Electrical Bonding-Power line filter-CM filter-DM filter-EMI suppression Cables- EMC Connectors -Isolation transformer.

UNIT V EMI AND EMC STANDARDS 9

Introduction- Standards for EMI/EMC- MIL-STD-461/462-IEEE/ANSI standard-CISPR/IEC standard FCC Regulations-British standards-VDE Standards-Euro Norms-Performance standards-some comparisons

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concepts of EMI and EMC
- synthesize solutions to EMI Sources
- evaluate the measurements in EMI
- examine, test and implement EMI system

- .compare the different EMI and EMC standards

TEXT BOOKS

1. Prasad Kodali – "Engineering Electromagnetic Compatibility – Principles, Measurements, andTechnologies", IEEE press.
2. Clayton R.Paul, "Introduction to Electromagnetic Compatibility", John Wiley Publications, 2008.

REFERENCES

1. Don R.J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V.
2. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Ed, Artech house, Norwood, 1987
3. Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	2	-	1	-	-	-	-	-	-	1	1
CO2	3	-	-	2	-	1	-	-	-	-	-	-	1	1
CO3	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO4	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO5	3	-	-	2	2	1	-	-	-	-	-	-	1	1

EC16354 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the simulation techniques.
- learn the concept of random variables and random process simulation.
- learn the concept of radio communication channel modeling.
- understand the process of estimating the performance measure.
- analyze the simulation environment and considerations.

UNIT I SIMULATION METHODOLOGY 9

Introduction-Aspects of Methodology-Performance Estimation-Sampling Frequency-Low pass equivalent models for band pass signals-multicarrier signals-Non-linear and time varying systems-Post processing-Basic Graphical techniques and estimations

UNIT II SIMULATION OF RANDOM VARIABLES RANDOM PROCESS 9

Generation of random numbers and sequence-Gaussian and uniform random numbers Correlated Random Sequences-Testing of random numbers Generators-Stationary and uncorrelated Noise- Goodness of fit test.

UNIT III MODELING OF COMMUNICATION SYSTEMS 9

Radio frequency and optical Sources-Analog and Digital Signals-Communication channel and Models Free Space Channels-Multipath channel and discrete channel noise and interference.

UNIT IV ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION 9

Quality of estimator, Estimation of SNR-Probability density function and bit error rate-Monte Carlo method-Importance sampling method-Extreme value theory.

UNIT V SIMULATION AND MODELING METHODOLOGY 9

Simulation environment-Modeling considerations-Performance evaluation techniques-error source simulation-Validation.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- synthesize programs in simulation techniques.
- analyse and design communication channels
- apply the concept of modeling of communication systems
- examinethe simulation methodologies and performance
- analyze error source simulation

TEXT BOOKS

1. MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.
2. Geoffrey Gorden, System Simulation, 2nd Edition, Prentice Hall of India, 1992.

REFERENCES

1. Averill.M.Law and W.DavidKelton,Simulation Modeling and Analysis, McGraw-Hill Inc., 2000.
2. W.Turin, Performance Analysis of Digital Communication Systems, Computer Science Press, New York, 1990.
3. Jerry banks and John S.Carson, Discrete Event System Simulation, Prentice Hall ofIndia, 1984.
4. William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.KurtL.Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore)Pvt Ltd, 2004.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO2	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO3	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO4	3	-	-	2	2	1	-	-	-	-	-	-	1	1
CO5	3	-	-	2	2	1	-	-	-	-	-	-	1	1

EC16451 TELEVISION SIGNAL PROCESSING AND DISPLAY SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain the knowledge about the fundamental analysis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
- know the principles and operation of Studio Equipment.
- learn the principles of Transmission and Propagation Systems.
- understand the various Digital Television Standard.
- acquire the concept of Modern Technology of Television.

UNIT I FUNDAMENTALS OF TELEVISION 9

Television System and Scanning Principles: Sound and Picture Transmission Video Signals Characteristics of Human Eye-Aspect Ratio and Rectangular Scanning-Persistence of Vision and Flicker-Vertical Resolution- Kell Factor-Horizontal Resolution and Video Bandwidth- Interlaced Scanning. Camera Tubes: Vidicon-Plumbicon- Silicon Diode Array Vidicon-CCD-Solid State Image Scanners

UNIT II TELEVISION STANDARDS AND STUDIO EQUIPMENTS 9

Composite Video Signal-Horizontal and Vertical Synchronous-Blanking Standards-Reception of VSB Signals- TV Broadcast Channels-CCIR-B Standards. Various TV Broadcast Systems: NTSC, PAL and SECAM System.

UNIT III TELEVISION TRANSMISSION SYSTEM, PROPAGATION AND ANTENNA 9

Requirements of TV Broadcast Transmission-Block diagram of TV Transmitters-Transmitting Antennas- Propagation Phenomena-Space Wave Propagation-Line of Sight Range-Shadow Zones Co Channel Interference- Ghost Images Interference Problems-Parasitic Elements-Receiving Antennas.

UNIT IV DIGITAL TELEVISION 9

Digital TV: Introduction-Digital System Hardware-Signal Quantization and Encoding, Digital Satellite Television-Direct to Home Satellite Television-Digital TV Receivers-Merits of Digital TV Receivers Geo Stationary Satellite-Satellite Communication Systems-Colour picture Tube-PIL-Delta Gun Trinitron-Operation.

UNIT V MODERN TV TECHNOLOGIES 9

Stereo Sound Systems-Projection Television-Flat panel Display TV receivers-3-D Television Picture EDTV-HDTV-CATV-Cable signal Processing, Cable signal Distribution-Displays devices-LCD LEDOLED-Operation.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the fundamental analysis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes

- analyze the principles and operation of Studio Equipment.
- evaluate the principles of transmission and propagation systems.
- compare various Digital Television Standards.
- synthesize the modern technologies of Television.

TEXT BOOKS

1. R-R-Gulati-"Modern Television Practice -Technology and Servicing – Third Edition – New age International publishes -2012.
2. R-R-Gulati-"Monochrime and Colour Television – Second Edition – New age Internationa publishes -2009.

REFERENCES

1. A-M-Dhake-" Television and video Engineering" Second Edition TMH 2003. R.G.Gupta, "Television Engineering and Video systems," First Edition, TMH India 2007. 3. S-P-
2. Bali-" Colour Television -Theory and practice "- TMH 1994
3. Bernard Grob," Basic Television Principles and Servicing"- Second Edition, New age International Publisher 2004.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2		-	-	-	-	-	-	1	1
CO2	3	1	-	2	2		-	-	-	-	-	-	1	1
CO3	3	1	-	2	2		-	-	-	-	-	-	1	1
CO4	3	1	-	2	2		-	-	-	-	-	-	1	1
CO5	3	1	-	2	2		-	-	-	-	-	-	1	1

EC16452 **SPACE TIME COMMUNICATION** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- acquire the knowledge on coding schemes for space-time Wireless Communications.
- understand the concepts of transmission and decoding techniques in Wireless Communications.
- learn the diversity performance in extended channels
- gain knowledge in coding of multiple antenna and receivers
- study the Spread Spectrum and MIMO Multiuser Detection

UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION **9**

Wireless channel-Scattering model in macro cells-Channel as a ST random field-Scattering functions Polarization and field diverse channels-Antenna array topology-Degenerate channels reciprocity and its implications-Channel definitions-Physical scattering model- Extended channel models-Channel measurements-sampled signal model-ST Multiuser and ST interference channels ST channel estimation.

UNIT II CAPACITY OF MULTIPLE ANTENNA CHANNELS **9**

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter Channel known to the transmitter-capacity of random MIMO channels-Influence of Rician fading fading correlation-XPD and degeneracy on MIMO capacity-Capacity of frequency selective MIMO channels.

UNIT III SPATIAL DIVERSITY **9**

Diversity gain-Receive antenna diversity-Transmit antenna diversity-Diversity order and channel variability-Diversity performance in extended channels-Combined space and path diversity-Indirect transmit diversity-Diversity of a space-time-frequency selective fading channel.

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS **9**

Coding and interleaving architecture-ST coding for frequency flat channels-ST coding for frequency selective channels-Receivers: SISO, SIMO, MIMO-Iterative MIMO receivers Exploiting channel knowledge at the transmitter: linear pre-filtering-optimal pre-filtering for maximum rate-optimal prefiltering for error rate minimization-selection at the transmitter Exploiting imperfect channel knowledge.

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION **9**

SISO-OFDM modulation-MIMO-OFDM modulation-Signalling and receivers for MIMO-OFDM, SISO SS modulation-MIMO-SS modulation-Signalling and receivers for MIMO-SS. MIMO MAC MIMO-BCO utage performance for MIMO-MU and MIMO-MU with OFDM, CDMA and multiple antennas.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the coding schemes for space-time Wireless Communications.
- evaluate the capacity of multiple antenna channels
- explain the antenna diversity schemes
- compare the coding of multiple antenna and receivers
- .analyze the concepts of Spread Spectrum and MIMO Multiuser Detection

TEXT BOOKS

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005
2. Paulraj, RohitNabar, Dhananjay Gore., "Introduction to Space Time Wireless Communication Systems",Cambridge University Press, 2003

REFERENCES

1. Andre Viterbi " Principles of Spread Spectrum Techniques" Addison Wesley 1995
2. Jafarkhani, Hamid. Space-time coding: Theory and Practice. Cambridge University press, 2005. 3. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	1	-	-	-	-	-	-	-	1	-
CO2	3	1	-	2	1	-	-	-	-	-	-	-	1	-
CO3	3	1	-	2	1	-	-	-	-	-	-	-	1	-
CO4	3	1	-	2	1	-	-	-	-	-	-	-	1	-
CO5	3	1	-	2	1	-	-	-	-	-	-	-	1	-

EC16453 WEB TECHNOLOGY 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn the concepts and architecture of the world wide web
- understand and practice mark-up languages
- understand the web design
- study the basic concepts of java programming
- gain knowledge of web services

UNIT I INTRODUCTION TO WWW 9

Internet Standards-Introduction to WWW-WWW Architecture-SMTP-POP3-File Transfer Protocol Overview of HTTP, HTTP request-response-Generation of dynamic web pages.

UNIT II HTML BASICS 9

Development Process-Requirements Engineering-Design-Implementation-Integration and Testing Packaging-Configuration Management-Managing Embedded System Development Project.

UNIT III CASCADING STYLE SHEET 9

Cascading Style Sheet (CSS3): The need for CSS-Basic syntax and structure Inline Styles Embedding Style Sheets Linking External Style Sheets-Introduction to CSS3-Backgrounds Manipulating text-Margins and Padding Positioning using CSS-Responsive Web Design.

UNIT IV JAVA BASICS 9

Introduction to Java-Test-driving a java application-Input / Output and operators-Classes, Objects, Methods and strings-control statements-Methods: A deeper look-Arrays and Array Lists-classed and objects: A deeper look Inheritance-polymorphism and Interfaces-Exception handling.

UNIT V XML AND WEB SERVICES 9

XML-Introduction-Form Navigation-XML Documents-DTD-Namespace-XSL-XSLT-Web services UDDI-WSDLJava web Services-Web resources.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand the technologies used in web programming
- create a basic website using HTML
- design and implement simple web page using Cascading Style Sheets.
- analyze the salient features of Java over C++ and write programs using fundamental Concepts
- .build web-based application and to present data in XML format.

TEXT BOOKS

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web-How to Program", Fifth Edition, Pearson Education,2011
2. Herbert schildt java The complete Reference 7th Edition. Tata McGraw Hill Edition
3. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, 2010

REFERENCES

1. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013
2. Michael Morrison XML Unleashed Tech media SAMS.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	1	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	1	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	1	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	1	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	1	-	-	-	-	-	-	-	1	1

EC16454 BIOSIGNAL PROCESSING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the characteristics of biomedical signals
- know the principles of noise filtering and Interference cancellation
- learn the event detection and extraction techniques
- know the modeling of biomedical systems
- understand the pattern classification and diagnostic decision

UNIT I BIOMEDICAL SIGNALS 9

Introduction to Biomedical Signals-ECG, EEG, EMG, ENG etc. Event related Potentials- Biomedical Signal Analysis- Computer Aided Diagnosis. Concurrent, coupled and correlated processes-illustration with Case studies.

UNIT II NOISE FILTERING 9

Random noise structured noise and physiological interference-noise and artifacts in ECG. Time domain filters-Frequency domain filters-Principles of adaptive filters-Wiener Filtering- Steepest Descent algorithms Widrow Hopf, Least mean square adaptive algorithms-Adaptive noise canceller-Interference cancellation in Electrocardiography- noise cancellation in electro surgery.

UNIT III EVENT DETECTION AND EXTRACTION 9

Detection of PQRS and T waves in ECG-EEG Rhythms-Detection of EEG spike and wave complex esdensity-Homomorphic filtering. Analysis of event related Potential-Morphological analysis of ECG Waves-Envelope extraction and Analysis-Analysis of activity: zero crossing rates. Fourier Spectrum, Estimation of power spectral moments and spectral power ratio.

UNIT IV MODELING OF BIOMEDICAL SYSTEMS 9

Point Processes-Parametric System Modelling-All-pole, pole zero modelling, electromechanical models of signal generation. Analysis of non-stationary signals: Characterization-Fixed segmentation-Short Time Fourier Transform-Adaptive segmentation- Adaptive filters for segmentation-RLS and Lattice Filter.

UNIT V PATTERN CLASSIFICATION AND DIAGNOSTIC DECISION 9

Supervised and unsupervised pattern Classification-Probabilistic models and statistical Decisions Logistic of regression analysis-training and test steps neural Networks-Measures of diagnostic accuracy and Cost Reliability classifiers and decisions. Application: Normal versus Ectopic ECG beats-Detection of Knee Joint cartilage Pathology.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the basics of biomedical signals
- compare the noise filtering techniques
- analyze event detection and extraction of bio signals
- apply the different models of biomedical systems.
- evaluate the pattern classification and decision making techniques.

TEXT BOOKS

1. Rangaraj M. Rangayyan, "Biomedical Signal Analysis - A case study approach", Wiley- Interscience /IEEE Press, 2002
2. D.C.Reddy, "Biomedical Signal Processing: Principles and techniques", Tata McGraw Hill, New Delhi, 2005.

REFERENCES

1. MetinAkay, "Biomedical Signal Processing", Academic press, Inc
2. Bruce, "Biomedical Signal Processing & Signal Modeling," Wiley, 2001
3. KhandpurR.S, "Hand Book of Biomedical Instrumentation", Tata McGraw Hill publication, New Delhi 2nd edition 2003.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16801 **WIRELESS NETWORKS** **4 0 0 4**

COURSE OBJECTIVES

To enable the students to

- know the challenges in Wireless Networks.
- study the WLANs standards
- acquire the generations of WWANs
- learn the necessity of Adhoc and sensor networks
- gain the knowledge of advancements in wireless network

UNIT I CHALLENGES IN WIRELESS NETWORKS **12**

Medium Access Alternatives-Fixed Assignment for Voice Oriented Networks-Random Access for Data Oriented Networks-Handoff and Roaming Support-Security and Privacy.

UNIT II WIRELESS LANs **12**

802.11b WLAN-Architecture and Services-Installation of WLAN-Other IEEE 802.11 standards and a,g,n-HIPERLAN-Wi–Fi and Wi-Max standards.

UNIT III WIRELESS WANs **12**

First Generation Analog-Second Generation TDMA-GSM, GPRS-Second Generation CDMA-IS-95 Third Generation Systems WCDMA-CDMA 2000.

UNIT IV ADHOC AND SENSOR NETWORKS **12**

Characteristics of MANETs-Table-driven and Source initiated On Demand routing protocols Hybrid protocols- Wireless Sensor networks-Classification-Routing protocols-Sensor Network Architecture-Data Dissemination-Data Gathering-MAC Protocols for Sensor Networks-Location Discovery and quality of a Sensor Network.

UNIT V ADVANCES IN WIRELESS NETWORKS **12**

Introduction of 4G vision-4G features and challenges-Applications of 4G-Bluetooth-ZigBee-Ultra wide Band Radio communication-Optical wireless Networks-Software Defined Radio-Cognitive Radio.

TOTAL PERIODS 60

COURSE OUTCOMES

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

- examine the challenges in Wireless Networks.
- analyse the different concept of WLAN standards
- design the generations of WWANs
- evaluate the necessity of Adhoc and sensor networks.
- apply the concept of advancements in wireless networks.

TEXT BOOKS

1. KavehPahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks: A unified approach", Prentice Hall, 2002.
2. Dharma PrakashQing–AnZeng&Agrawal, “Introduction to Wireless and Mobile Systems”, 4thEdition,Thomson India Edition, 2015.

REFERENCES

1. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, 2007.
2. Clint Smith, P.E. & Daniel Collins, “3G Wireless Networks”, 3rd Edition, Tata McGraw Hill, 2014.
3. Gary. S. Rogers & John Edwards, “An Introduction to Wireless Technology”, Prentice Hall, 2003.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	1	-	-	-	-	-	2	3	3
CO2	3	1	-	2	2	1	-	-	-	-	-	2	3	3
CO3	3	1	-	2	2	1	-	-	-	-	-	2	3	3
CO4	3	1	-	2	2	1	-	-	-	-	-	2	3	3
CO5	3	1	-	2	2	1	-	-	-	-	-	2	3	3

EC16802 PROJECT WORK (PHASE II) 0 0 12 6

COURSE OBJECTIVES

To enable the students to

- learn to work as a member of a project team.
- understand project management tasks.
- simulate software solution for a real-time, industry relevant problem
- develop a hardware for a real-time, industry relevant problem

Every student will be required to undertake a suitable project work in the Department during VIII semester, in consultation with the Head of the Department and the guide. Every student will have to submit their project report at the end of the Semester within the stipulated time as announced by the Institute/Department.

COURSE OUTCOMES

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

- apply knowledge of basic science and engineering to Electronics and Communication Engineering problems
- recognize the real world applications and to solve with core engineering knowledge.
- analyze and work on multidisciplinary tasks
- choose latest tools, software and equipment to solve real world problems identify, formulate, and model engineering equipment

TOTAL PERIODS 180

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO2	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO3	3	2	3	2	3	2	1	1	2	2	3	1	3	2
CO4	3	2	3	2	3	2	1	1	2	2	3	1	3	2

EC16551 OPTOELECTRONIC DEVICES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basics of solid state physics
- acquire the knowledge of display devices.
- learn the concepts of optical detection devices.
- know the design of optoelectronic integrated circuits.
- gain knowledge about optoelectronic integrated circuits.

UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Fundamentals of Wave nature of light-Polarization-Interference-Diffraction-Light Source-review of Quantum Mechanical concept-Review of Semiconductor Physics and Semiconductor Junction theory.

UNIT II DISPLAY DEVICES AND LASERS 9

Photo Luminescence-Cathode Luminescence-Electro Luminescence-Injection Luminescence Light Emitting Diodes-Plasma Display-Liquid Crystal Displays-Numeric Displays-Laser Emission- Absorption, Radiation-Population Inversion-Optical Feedback-Threshold condition Laser Modes-Classes of Lasers-Mode Locking Laser applications.

UNIT III DETECTION DEVICES 9

Photo detection Principle-Photoconductors-Noise in photoconductors-Photodiodes-PIN Photodiode-APD-Detector performance parameters-Detectors for long wavelength operation wavelength-selective detection Charge Coupled Device.

UNIT IV OPTOELECTRONIC MODULATOR 9

Analog and Digital Modulation-Electro-optic modulators-Magneto-optic Devices-Acousto-optic devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Hybrid and Monolithic Integration-Application of Opto Electronic Integrated Circuits- Integrated transmitters and Receivers-Guided wave devices.

COURSE OUTCOMES

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

- examine the basics of solid state physics.
- analyze the design of optoelectronic detection devices and modulators.
- evaluate the concepts of optical detection devices.
- synthesize the design of optoelectronic integrated circuits.
- .apply the concepts of Opto electronic and integrated circuits

TEXT BOOKS

1. Pallab Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi
2. Jasprit Singh, "Opto Electronics – As Introduction to Materials and Devices", McGraw-Hill International Edition, 1998

REFERENCES

1. S.O.Kasap, "Opto Electronics and Photonics – Principles and Practices", Pearson, Second Edition
2. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India, 2005.
3. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall, 1995

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16552 MICROELECTRO MECHANICAL SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn MEMS and its fabrication methods.
- understand the principle of mechanical sensing.
- study the micro-Opto-electro principles.
- acquire the principle of magnetic sensing.
- gain knowledge about the significance of radio frequency MEMS and its applications.

UNIT I MEMS AND ITS FABRICATION METHODS 9

Definition of MEM-MEMS history and development-micro machining-lithography principles and methods- structural and sacrificial materials-thin film deposition-impurity doping-etching-surface micro machining-wafer bonding.

UNIT II MECHANICAL SENSORS AND ACTUATORS 9

Principles of sensing and actuation: beam and cantilever-capacitive-piezo electric-strain-pressure- flow-pressure mea by micro phone-MEMS gyroscopes-shear mode piezo actuator-gripping piezo Actuator Inchworm technology.

UNIT III MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS 9

Principle of MOEMS technology-properties of light-light modulators-beam splitter-micro lense-mico Mirrors digital micro mirror device-light detector-grating light value-optical switch-wave guide and Tuning-shear stress measurement

UNIT IV MAGNETIC SENSORS AND ACTUATORS 9

Magnetic materials for MEMS and properties-magnetic sensing and detection-magneto resistive sensor-more on hall effect-magneto diodes-magneto transistor-MEMS magnetic sensor-MEMS actuators by directional micro ac circuit integrated magnetic actuator-magnetic probe based storage device.

UNIT V RADIO FREQUENCY MEMS 9

RF based communication systems-RF MEMS, MEMS inductors-varactors-tuner/filter-resonator clarification of tuner-filter-resonator-MEMS switches-phase shifter.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the basics of MEMS
- analyze the principle of mechanical sensing.
- apply the micro-opto-electro principles.
- synthesize the principle of magnetic sensing.

- compare the radio frequency MEMS and its application

TEXT BOOKS

1. NitaigourPremchandMahalik, "MEMS", TMH Publishing co.
2. Tai-Ran Hsu, "MEMS and Micro Systems: Design and Manufacture", TMH Publishers.

REFERENCES

1. Chang Liu, "Foundation of MEMS", Prentice Hall Ltd.
2. Sergey EdwrdLyshevski, "MEMS and NEMS", CRC Press, Indian Edition.
3. Mohamed Gad-el-Hak, "MEMS – Introduction and fundamentals", Taylor and Francis, Second Edition, 2013

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16553 MOBILE OPERATING SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic concepts of mobile computing
- be familiar with the network protocol stack
- learn the basics of mobile telecommunication system
- be exposed to ad-hoc networks
- study about different mobile platforms and application development

UNIT I MOBILE COMPUTING 9

Mobile Computing-Mobile Computing vs wireless Networking-Mobile Computing Applications Characteristics of Mobile Computing-Structure of Mobile Computing Application. MAC Protocols Wireless MAC Issues-Fixed Assignment Schemes-Random Assignment Schemes-Reservation Based Schemes.

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER 9

Overview of Mobile IP-Features of Mobile IP-Key Mechanism in Mobile IP-route Optimization. Overview of TCP/IP-Architecture of TCP/IP-Adaptation of TCP Window Improvement in TCP Performance.

UNIT III MOBILE TELECOMMUNICATION SYSTEM 9

Global System for Mobile Communication (GSM)-General Packet Radio Service (GPRS) Universal Mobile Telecommunication System (UMTS).

UNIT IV MOBILE AD-HOC NETWORKS 9

Ad-Hoc Basic Concepts-Characteristics-Applications-Design Issues-Routing-Essential of Traditional Routing Protocols-Popular Routing Protocols-Vehicular Ad Hoc networks (VANET)-MANET vs VANET-Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS 9

Mobile Device Operating Systems-Special Constrains & Requirements-Commercial Mobile Operating Systems- Software Development Kit: Ios-Android, Black Berry Windows Phone - M-Commerce-Structure- Pros & Cons- Mobile Payment System Security Issues.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the basics of mobile telecommunication system
- choose the required functionality at each layer for given application
- identify solution for each functionality at each layer
- use simulator tools and design ad hoc networks

- develop a mobile application

TEXT BOOKS

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi 2012.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concept”, 9th Edition, John Wiley and Sons Inc.,2012

REFERENCES

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007
2. Dharma PrakashAgarval, Qing and a Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005
3. We Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of MobileComputing”, Springer, 2003

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16554 MULTIMEDIA COMPRESSION AND COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- have a complete understanding of error–control coding
- understand encoding and decoding of digital data stream
- introduce methods for the generation of these codes and their decoding techniques.
- have a detailed knowledge of compression and decompression techniques.
- introduce the concepts of multimedia communication

UNIT I MULTIMEDIA COMPONENTS 9

Introduction-Multimedia Skills-Multimedia components and their Characteristics-Text-sound images graphics-animation-video-hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression-DPCM-Adaptive PCM-adaptive predictive coding-linear Predictive coding code excited LPC-perceptual coding Video compression-priciples-H.261-H.263-MPEG 1, 2,4.

UNIT III TEXT AND IMAGE COMPRESSIOM 9

Compression principles-source encoders and destination encoders-lossless and lossy compression entropy encoding-source encoding-text compression-static Huffman coding dynamic coding-arithmetic coding-Lempel ziv-welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport-VoIP challenges-H.323/ SIP-Network Architecture-Protocols-Call establishment and release-VOIP and SS7-Quality of Service-CODEC Methods-VOIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking-Applications-streamed stored and audio-making the best Effort service protocols for real time interactive Applications-distributing multimedia-beyond best effort services ecluding and policing Mechanism-integrated services-differentiated Services-RSVP.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the multimedia components, both hardware and software
- apply the compression techniques for audio and video
- compare the concepts text and image compression techniques
- evaluate the VIOP networks and protocols
- analyze Implementation and applications of multimedia networking

TEXT BOOKS

1. Fred HAlshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: making it work”, 7/e, TMH 2007

REFERENCES

1. Marcus goncalves “Voice over IP Networks”, Mcgraw hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education
4. Ranjan Parekh, “Principles of Multimedia”, TMH 2006

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16651 MEDICAL ELECTRONICS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study about the various physiological parameters both electrical and non-electrical and the methods of recording
- analyse about the method of transmitting those parameters
- study about the various assist devices used in the hospitals
- know about equipment used for physical medicine and the various recently developed diagnostic and therapeutic technique
- learn about the recent trends in Medical Instrumentation

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials: Bio potential electrodes-Biological amplifier-Difference amplifier and chopper amplifier- ECG-EEG-EMG-PCG-lead systems and recording methods-typical waveforms and signal characteristics

UNIT II NON ELECTRICAL PARAMETER MEASUREMENT 9

Auto analyzer-Blood flow meter-Cardiac output-Respiratory measurement-Blood Pressure-Blood cell Counters

UNIT III ASSIST DEVICES 9

Cardiac Pacemakers-Classification of Pacemakers-Defibrillator-DC Defibrillator-Dialyzer-Heart lung machine.

UNIT IV LASER, DIATHERMIES AND ULTRASONIC APPLICATIONs 9

Principle of Laser action-Different types and clinical applications of laser-Ultrasonic frequency for medical application- Diathermies-Shortwave-Ultrasonic and microwave type and their applications Surgical Diathermy-Radio-pill

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Principle and application of Thermography-Principle and application of Nanotechnology-Endoscopy and Ophthalmic equipment's-Principles of Lithotripsy

TOTAL PERIODS 45

COURSE OUTCOMES

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

- compare the concepts about electro-physiology, ECG,EEG, EMG and PCG
- apprehend the different types of measurements in Non-electrical parameter.
- analyse the functions of various machines to save human life
- examine the concept of laser, ultrasonic which is involved in medical field
- apply the recent trends in field of diagnostic and therapeutic equipment's

TEXT BOOKS

1. Leslie Cromwell, Fred J.Weibell and Erich A.Pfeiffer, "Biomedical Instrumentation and Measurement", Prentice Hall New Delhi 2000
2. John G.Webster, "Medical Instrumentation Application and Design", Third Edition, Wiley India Edition,2007

REFERENCES

1. Albert M Cook and Webster J G –Therapeutic medical devices Prentice Hall Nee York 1982
2. Khandpur R.S Hand Book of Biomedical Instrumentation –Tata McGraw Hill publication,New Delhi 2nd edition 2003
3. Jacobson B and Webster J G Medical and Clinical Engineering –Prentice Hall of India New Delhi 1999
4. Wolbasrsht . M. L, Laser Application in Medicine and Biology plenum press NewYork 1989.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16652 CELLULAR AND MOBILE COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the fundamental cellular radio concepts
- analyse the different ways of radio propagation models
- study various modulation and equalization techniques
- learn about multiple access and speech coding techniques
- know the generation of wireless networks and wireless standards

UNIT I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9

Introduction to wireless communication: Evolution of mobile communications-mobile radio systems Examples. Cellular Concept: Frequency reuse-channel assignment-hand off-Interference and system capacity-tracking and grade of service-Improving Coverage and capacity in Cellular systems.

UNIT II MOBILE RADIO PROPAGATION 9

Free space propagation model-reflection-diffraction-scattering-link budget design-Outdoor Propagation models Indoor propagation models-Small scale Multipath propagation-Impulse model- Small scale Multipath measurements-parameters of Mobile multipath channels-types of small scale fading

UNIT III MODULATION TECHNIQUES AND EQUALIZATION 9

Modulation Techniques: Minimum Shift Keying-Gauss ion MSK-M-ary QAM-M-ary FSK Orthogonal Frequency Division Multiplexing-Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels. Equalization: Survey of Equalization Techniques-Linear Equalization Non-linear Equalization-Algorithms for Adaptive Equalization Diversity Techniques, RAKE receiver.

UNIT IV CODING AND MULTIPLE ACCESS TECHNIQUES 9

Coding: Vocoders-Linear Predictive Coders-Selection of Speech Coders for Mobile Communication GSM Codec-RS codes for CDPD. Multiple Access Techniques: FDMA-TDMA-CDMA-SDMA Capacity of Cellular CDMA and SDMA

UNIT V WIRELESS SYSTEMS AND STANDARDS 9

Second Generation and Third Generation Wireless Networks and Standards-WLL-Bluetooth-AMPS-GSM-IS-95 and DECT

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the various cellular radio concepts used in wireless communication
- evaluate the different radio propagation models
- compare different equalization and diversity techniques
- synthesize different multiple access techniques.

- analyze different wireless standards and generations

TEXT BOOKS

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/Prentice Hall of India, Third Indian Reprint 2003.
2. Andreas.F.Molisch, "Wireless Communication", John Wiley- India 2006

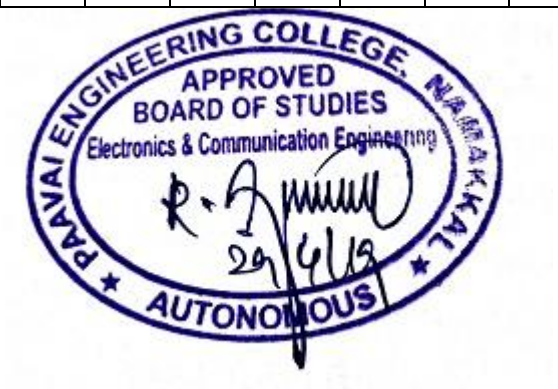
REFERENCES

1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw- Hill International, 1998
3. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003
4. KavehPahlavan , Prashant Krishnamurthy, "Principles of Wireless Networks: A unified approach", Prentice Hall – 2002

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	1	1	1



EC16653 RF MICROELECTRONICS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the concepts in RF design
- understand the communication concepts in microelectronics
- learn about transceiver architecture
- gain knowledge on the concepts and types of PLL
- study the power amplifiers concepts in microelectronics

UNIT I CONCEPTS IN RF DESIGN 9

Introduction to RF-Design challenges of RF-General consideration-Effects of Nonlinearity-Noise Sensitivity and dynamic range-Passive impedance Transformation-Scattering parameters-Analysis of Nonlinear dynamic systems-Volterra series.

UNIT II COMMUNICATION CONCEPTS 9

General consideration-Analog and Digital modulation-Spectral regrowth-Mobile RF communications Multiple access techniques-Wireless standards.

UNIT III TRANSCEIVER ARCHITECTURE 9

Receiver architecture: Basic heterodyne Receivers-Modern Heterodyne Receivers-Direct conversion receivers- Image Reject Receivers-Low IF Receivers. Transmitter architectures: Direct conversion transmitters-Modern direct conversion transmitters-Heterodyne Transmitters-Other TX architectures-OOK transceivers.

UNIT IV PHASE LOCKED LOOPS 9

Basic concepts-Type-I PLLs-Type-II PLLs-PFD/CP Non idealities-Phase noise in PLLs Loop Bandwidth Design procedure

UNIT V POWER AMPLIFIERS 9

General considerations-Classification of power amplifiers-High efficiency power amplifiers-Cascode output Stages-Large signal impedance matching-Basic Linearization Techniques-Polar modulation-Out phasing Doherty power amplifier-Design Examples

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concepts in RF design
- analyze the communication concepts in microelectronics
- compare various transceiver architecture
- evaluate the concepts and types of PLL in microelectronics
- examine power amplifiers concepts in RF microelectronics.

TEXT BOOKS

1. B.Razavi, "RF Microelectronics", Prentice Hall PTR, 1998.
2. BehzadRazavi, "Design of Analog CMOS Integrated Circuits", McGraw Hill, Second Edition, 2008

REFERENCES

1. R. Jacob Baker, H.W.Li and D.E. Boyce, "CMOS Circuit Design, Layout and Simulation", Prentice-Hall of India,1998
2. Y.P.Tsividis, "Mixed Analog and Digital VLSI Devices and Technology", McGraw Hill, 1996
3. Robert E Colin, "Foundations for Microwave Engineering", John Wiley & Sons Inc, 2005

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	-	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	-	1	1

EC16654 VIRTUAL INSTRUMENTATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know about virtual versus traditional instruments and programming techniques
- learn about A/D and D/A converter and data acquisition
- study PC buses, Instrumentation buses and network protocols
- introduce the concepts of real time control
- learn about design using VI software

UNIT I VIRTUAL INSTRUMENTATION 9

Virtual Instrumentation-Definition and Flexibility-Block diagram and Architecture for Virtual Instruments versus Traditional Instruments-Review of software in Virtual Instrumentation-VI Programming techniques-VI sub-VI Loop and Charts-Arrays-Clusters and Graphs-Case and Sequence Structures-Formula nodes-String and File Input/Output.

UNIT II DATA ACQUISITION IN VIRTUAL INSTRUMENTATION 9

A/D and D/A converters-Plug-in Analog Input / Output cards-Digital Input and Output Cards Organization of the DAQ VI system-Opto-isolation-Performing analog input and analog output Scanning multiple analog channels-Issues involved in selection of Data acquisition cards-Data acquisition modules with serial communication-Design of digital voltmeter with transducer input Timers and Counters

UNIT III COMMUNICATION NETWORKED MODULES 9

Introduction to PC Buses-Local busses: ISA-PCI-RS232-RS422 and RS485-Interface Buses: USB PCMCIAVXI-SCXI and PXI-Instrumentation Buses: Modbus and GPIB-Networked busses-ISO/OSI Reference model-Ethernet and TCP/ IP Protocols

UNIT IV REAL TIME CONTROL IN VIRTUAL INSTRUMENTATION 9

Designs using VI Software -ON/OFF controller-Proportional controller-Modeling and basic control of level and reactor processes-Case studies on development of HMI-SCADA in VI

UNIT V OPERATING SYSTEM AND HARDWARE OVERVIEW 9

PC architecture-current trends-operating system requirements-PC based instrumentation-analog and digital interfaces- PXI and SCXI main frame-modular Instruments-Transducers-power-speed and timing considerations.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine virtual instrumentation concepts.
- analyze the various acquisition methodologies.
- evaluate traditional and virtual instrumentation.

- discuss operating systems required for virtual instrumentation.
- .synthesize the implementation methods for instrumentation

TEXT BOOKS

1. Barry Paton, "Sensor, transducers and LabVIEW", Prentice Hall of India 2000
2. Sanjay Gupta and Joseph John, " Virtual Instrumentation using LabVIEW" Second Edition

REFERENCES

1. Lisa K Wells and Jeffery Travis "LabVIEW for Everyone", Prentice Hall of India.1996
2. Buchanan, W. "Computer buses", CRC Press 2009
3. Jeffery Travis "Internet applications in LabVIEW", Prentice Hall of India.1996

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	1	1	1

EC16904 RADAR AND NAVIGATIONAL AIDS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge about RADAR theory and equations.
- learn the moving target indicator and pulse Doppler RADAR
- study the concept of RADAR signal detection and propagation
- understand about radio navigation techniques
- know the various types of RADAR transmitter and receivers

UNIT I BASICS OF RADAR 9

RADAR block diagram-Operation & Applications-RADAR frequencies-RADAR range equationDetection of signals in noise-RADAR cross section of targets-RADAR cross section fluctuationsTransmitter power-Pulse repetition frequency-System losses and Propagation effects

UNIT II MOVING TARGET INDICATOR (MTI) AND PULSE DOPPLER RADAR 9

Audio compression-DPCM-Adaptive PCM-adaptive predictive coding-linear Predictive coding code excited LPC-perceptual coding Video compression-priciples-H.261-H.263-MPEG 1, 2,4.

UNIT III RADAR SIGNAL DETECTION & PROPAGATION **9**

Compression principles-source encoders and destination encoders-lossless and lossy compression entropy encoding-source encoding-text compression-static Huffman coding dynamic coding-arithmetic coding-Lempel ziv-welsh Compression-image compression

UNIT IV RADIO NAVIGATION 9

Adcock directional finder-Automatic directional finder-Radio Compass-Decca Navigation System Tactical Air Navigation-Instrument Landing System-Ground Controlled approach-Microwave Landing system.

UNIT V RADAR TRANSMITTER AND RECEIVER 9

RADAR Transmitter-Linear beam power tubes-Solid state RF power sources-solid state devices used in RADAR- Magnetron-crossed field amplifiers-other aspects of radar transmitter-RADAR receiver - Receiver noise figure- Super heterodyne receiver-Dynamic range-RADAR Displays.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze the basic principles of RADAR
- apply the concept of moving target indicator and pulse Doppler RADAR
- elaborate the concept of RADAR signal detection and propagation
- identify the issues related to radio navigation
- examine the various RADAR transmitters and receivers

TEXT BOOKS

1. Skolnik.M.I, "Introduction to RADAR systems", Mc-Graw Hill, 3rd Edition, 2001
2. Nagaraja.N.S. "Elements of Electronic Navigation", Tata Mc-Graw Hill, 2nd Edition, 2009

REFERENCES

1. Mark, Richards.A, "Fundamentals of radar signal processing", Mc-Graw Hill, Electronic Engineering, 1st Edition, 2005
2. Brookner, "RADAR Technology", Artech House, 1st edition, 1986.
3. Bagad.V.S, "Radar Systems", Technical publications, 1st edition,2008
4. NadavLevanon, "RADAR Principles", John Wiley and Sons, 3rd Edition,1989

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	1	1	1

EC16905 **PLC AND DCS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- learn the requirements of automation systems and their importance
- introduce the automation components and their applications
- study regarding the concept of computer aided measurement techniques
- understand the basics about programmable logic controllers
- know the working of distributed control systems and its advantages

UNIT I INTRODUCTION TO AUTOMATION SYSTEMS 9

Automation Overview-Requirement of automation Systems-Architecture of Industrial Automation system- Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: Modbus and Profibus.

UNIT II AUTOMATION COMPONENTS 9

Sensors for temperature-pressure-force-displacement-speed-flow-level-humidity and pH measurement. Actuators-process control valves-power electronics devices DIAC-TRIAC-power MOSFET and IGBT. Introduction of DC and AC servo drives for motion control.

UNIT III COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS 9

Role of computers in measurement and control-Elements of computer aided measurement and control, man-machine interface-computer aided process control hardware-process related interfaces Communication and networking-Industrial communication systems-Data transfer techniques-Computer aided process control software-Computer based data acquisition system-Internet of things (IoT) for plant automation

UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9

Programmable controllers-Programmable logic controllers-Analog digital input and output modules-PLC programming-Ladder diagram-Sequential flow chart-PLC Communication and networking-PLC selection-PLC Installation-Advantage of using PLC for Industrial automation-Application of PLC to process control industries

UNIT V DISTRIBUTED CONTROL SYSTEM 9

Overview of DCS-DCS software configuration-DCS communication-DCS Supervisory Computer TasksDCS integration with PLC and Computers-Features of DCS-Advantages of DCS.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- design automation systems for various applications
- implement the detail knowledge on data acquisition system interface and DSC system
- apply the concept of computer aided measurement in several applications

- analyze the PLC selection, installation and its needs for industrial applications
- elaborate the concept of distributed control systems and its advantages

TEXT BOOKS

1. R.G.Jamkar,Industrial Automation Using PLC SCADA & DCS | PLC and SCADA,Global Education,2009
2. C D Johnson, "Process Control Instrumentation Technology", Prentice Hall India,8th Edition, 2006

REFERENCES

1. Hackworth,'Programmable Logic Controllers : Programming Methods And Applications, 1/E 2006
2. E.A.Parr, Newnes ,NewDelhi,"Industrial Control Handbook",3rd Edition, 2000
3. S.K.Singh, "Industrial Instrumentation", Tata Mcgraw Hill, 2nd edition companies,2003

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO2	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO3	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO4	3	1	-	2	2	-	-	-	-	-	-	1	1	1
CO5	3	1	-	2	2	-	-	-	-	-	-	1	1	1

EC16906 **NANO SCALE DEVICES** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the current challenges in Nano scale MOSFET
- learn about the working principle of Nano scale MOSFET
- study the basics of quantum transport devices
- acquire knowledge regarding CNT devices

UNIT I CHALLENGES NANO SCALE MOSFETS **9**

Overview of MOS Transistor-Scaling of transistor dimensions and Moore's Law-Challenges for Nano MOSFETs: Sub-threshold Conduction-DIBL-Velocity Saturation-Hot electrons. Emergence of new materials-Hi-k materials and its issues-metal gate-copper interconnect and low-k interlayer dielectric.

UNIT II NANO SCALE MOSFET **9**

SOI MOSFET-partially depleted and fully depleted SOI-Strained channel MOSFET-Hi-k gate dielectric Metal gate electrode-Double gate MOSFET-FINFET-Ferro electric FET.

UNIT III QUANTUM TRANSPORT DEVICES **9**

Limitations of classical mechanics-Basics of quantum mechanics-Schrodinger equation- Particle in a box Tunnel Effect-tunnelling through single barrier and double barrier-Coulomb blockade effect-Single Electron Transistor and Resonant Tunnelling Diode.

UNIT IV CNT DEVICES **9**

Carbon Nano Tube-Electronic properties of CNT-Geometrical structure-Electronic structure of CNT Transport properties-CNTFET-comparison of Si MOSFET with CNT MOSFET.

UNIT V SPINTRONICS **9**

Principle of Spintronic-Spin valves-SPINFET-Magnetic Tunnel Junctions and MRAM.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze the various challenges in designing of Nanoscale MOSFET
- apply the basic principles in designing of Nanoscale MOSFET
- elaborate the working concept of Quantum transport devices
- identify the issues associated with CNT devices
- .examine the spintronic concept and design MRAM based devices.

TEXT BOOKS

1. Rainer Waser (Ed.), "Nano electronics and Information Technology", Wiley-VCH, Third, Completely Revised and Enlarged Edition, 2012.
2. T.Pradeep, "A Textbook of Nanoscience and Nanotechnology", Mc Graw Hill, 2012.

REFERENCES

1. 1. AjoyGhatak and S. Lokanathan, "Quantum Mechanics: Theory and Applications", Fifth Edition, Macmillan Publishers, 2009
2. 2.Yong-Bin Kim, "Challenges for Nanoscale MOSFETs and Emergin Nanoelectronics", KIEEME
3. Transactions on Electrical and Electronic Materials, Vol. 11, No. 3, pp. 93-105, 2010.
4. 3.Kerry Bernstein, "Device and Architecture Outlook for Beyond CMOS Switches", Proceedings

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2		3	3										3	3
CO3				3	3	3		3					3	3
CO4				3	3		3		3			3	3	3
CO5		3	3	3	3				3	3	3	3	3	3

EC16907 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEM 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn the basics of batteries and starter system
- understand the principle of charging and light auxiliary system
- study the EEMS and various control modes
- acquire the concept of vehicle control motion
- gain knowledge about the significance of telematics and vehicle diagnosi

UNIT I BATTERIES AND STARTING SYSTEMS 9

Vehicle Batteries-Lead acid battery-Battery Rating-Lead Acid battery Charging methods-Testing Methods-Fault Diagnosis-Requirement of a starting System-Starter motor- Construction and Working of Starter Drive Mechanism-Starter Motor Fault Diagnosis-New Developments in Battery Technologies and Starting System.

UNIT II CHARGING SYSTEM AND LIGHTING AUXILIARIES 9

Alternator-D.C Generator-Alternator Charging Circuits and Rectification of AC to DC-Alternator Testing Methods-Mechanical and Electronic Voltage regulator-Lighting Fundamentals and Lighting CircuitConventional Headlamps and LED Lighting System-Wiper system and Signaling and Warning system.

UNIT III ELECTRONIC ENGINE MANAGEMENT SYSTEM 9

Gasoline Engine Fuel Injectors-Single point & Multi Point Fuel Injections-Testing of Fuel InjectorsConventional Ignition System-Electronic Ignition System-Programmed ignition system-Distributor less Ignition System-Digital Engine Control Modes-EGR Control and variable valve timing-Ignition Controlling-Closed loop ignition timing- Spark Advance Correction Scheme.

UNIT IV FUNDAMENTALS OF VEHICLE MOTION CONTROL 9

Cruise Control System-Adaptive Cruise Control System-Throttle Actuator-Stepper Motor Based Control-Antilock Braking Mechanism-Tire Slip Controller-Electronic Suspension System-Variable Damping-Variable Spring rate-Electric Power Assisted Steering Mechanism-Four Wheel Steering and Steer-byWire.

UNIT V TELEMATICS AND VEHICLE DIAGONSTICS 9

GPS Navigation-GPS Structure-Dead Reckoning using Inertial Navigation System-Electronic Control System Diagnostics-OBDII-Diagnostics Fault Codes-Introduction to Model-based Sensor Failure Detection-Case Study on MAF Sensor calibration.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the basics of batteries and starting system
- analyze the principle of lighting auxiliaries
- apply the ignition system in various machines
- synthesize the principle of vehicle control

TEXT BOOKS

1. Tom Denton "Automobile Electrical and Electronic Systems" 3rd edition, Elsevier Butterworth- Heinemann 2004.
2. William.B.Ribbens , "Understanding Automotive Electronics" 7th edition Butterworth-Heinemann publications,2012.

REFERENCES

1. Allan.W.M.Bonnick "Automotive Computer Controlled System", Butterworth-Heinemann .2001.
2. Robert Bosch Gmbh "Bosch Automotive Electric and Electronics" 5th edition Springer-Vieweg.2007.

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2		3	3										3	3
CO3				3	3	3		3					3	3
CO4				3	3		3		3			3	3	3
CO5		3	3	3	3				3	3	3	3	3	3