TITLE OF THE SUBJECT						
Subject Code	**MICROWAVE ENGINEERING & ANTENNA THEORY**	L	T	P	C	QP
MECPC2010		3	1	0	4	

Pre-Requisites :

Course Educational Objectives	
CEO1	To understand analysis, design and development of microwave circuits & system.
CEO2	To understand about Microwave transmission modes, Transmission lines.
CEO3	To understand about Microwave Antennas, Microwave Measurements, Microwave Systems.
CEO4	To understand Microwave Network Analysis.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Characterize microwave devices in terms of the directionality of communication.
CO2	Explain the operation of a given antenna based on its geometry; and describe its expected performance in terms of radiation pattern, efficiency, bandwidth, and polarization.
CO3	Design an antenna for some given feasible and realistic specifications.
CO4	To find, understand and use relevant technical literature to solve antenna problems.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3													
CO2	3	2													
CO3	2	2													
CO4	2	3													
Avg.	2.5	2.5													

SYLLABUS

Unit:1 **(10 hrs)**

Mathematical model of Microwave Transmission. Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission

Analysis of RF and Microwave Transmission Lines.

Coaxial Line, Rectangular Waveguide, Circular waveguide, Strip line, Microstrip Line.

Unit:2 **(10 hrs)**

Passive and Active microwave Devices.

Microwave Passive components: Directional Coupler, Power Divider, Microwave Passive components: Magic Tee, attenuator, resonator, Microwave Active components: Diodes, Transistors, Microwave Active components: oscillators, mixers, Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron**.**

Unit:3 **(10hrs)**

Fundamental Concepts: Physical concept of radiation, Radiation pattern, near-and far-field regions, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation. Radiation from Wires and Loops: Infinitesimal dipole, finite-length dipole, linear elements near conductors, small circular loop. Aperture and Reflector Antennas: Radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime focus parabolic reflector and cassegrain antennas.

Unit:4 **(10 hrs)**

Microstrip Antennas: Basic characteristics of microstrip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas. Antenna Arrays: Analysis of uniformly spaced arrays with uniform excitation amplitudes, extension to planar arrays, synthesis of antenna

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. R.E. Collins,"Foundations of Microwave Engg", –, TMH,2001

2. P.A. Rizzi ,"Microwave Engineering", Pearson Education, 2007

3. Joseph Helszajn ,"Microwave Engineering - Non-reciprocal active and passive circuits", McGraw Hill, 1992.

4. David M. Pozar, "Microwave Engineering", Third Edition, Wiley India.

Reference Books

1. M. Kulkarni ,"Microwave & Radar Engineering ", Umesh Publications, 2003.

2. Annapurna Das and Sisir K. Das ,"Microwave Engineering ",TMH, 2000.

3. Jordan, E.C. and Balmain, K.G., "Electromagnetic Waves and Radiating Systems",2nd Ed., Prentice-Hall of India. 1993

TITLE OF THE SUBJECT

Subject Code	**ADVANCED WIRELESS & MOBILE TECHNOLOGY**	L	T	P	C	QP
MECPC2020		3	1	0	4	

Pre-Requisites : Digital Communication mobile communication.

Course Educational Objectives	
CEO1	To understand The fundamentals of mobile wireless channels, and the limitations of mobile channels imposed on communication systems
CEO2	To know the The architectures of mobile communications, and recent standard mobile systems
CEO3	To understand The foundation of understanding and working for future generation of wireless systems
CEO4	To understand the Advanced modulation and transmission techniques, and practical channel coding schemes.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Know of frequency reuse and Co-channel Interference and different methods of cell splitting and sectoring.
CO2	Measure the real time Co-Channel Interference.
CO3	Apply the different methods of Handoff mechanisms.
CO4	Design and analyze Basic Cellular System.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3													
CO2	3	2													
CO3	3	2													
CO4	2	3													
Avg.	2.75	2.5													

SYLLABUS

Unit:1 **(8hrs)**

Cellular concepts: Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G ,3G and 4G cellular standards.

Unit:2 **(12 hrs)**

Signal propagation: Propagation mechanism, reflection, refraction, diffraction and scattering,

large scale signal propagation and lognormal shadowing.

Fading channels: multipath and small scale fading Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate. Capacity of flat and frequency selective channels. Antennas: antennas for mobile terminal- monopole antennas, PIFA, base station antennas and arrays.

Unit:3 **(10hrs)**

Multiple access schemes: FDMA, TDMA, CDMA and SDMA. Modulation schemes: BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM. Receiver structure: diversity receivers- selection and MRC receivers, RAKE receiver

Unit:4 **(10 hrs)**

Equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Alamouti scheme. MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures: outage, average snr, average symbol/bit error rate. System examples: GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. T. S. Rappaport, Wireless digital communications: Principles and practice, 2nd Ed., Prentice Hall India, 2007.

2. W. C. Y. Lee, Wireless and cellular telecommunications, 3rd Ed., MGH, 2006

Reference Books

1. G. L. Stuber, Principles of mobile communications, 2nd Ed., Springer, 2007.

2. Simon Haykin and Michael Moher, Modern Wireless Communication, Pearson education, 2005

TITLE OF THE SUBJECT						
Subject Code	**ADAPTIVE SIGNAL PROCESSING**	L	T	P	C	QP
MECPC2031		3	0	0	3	

Pre-Requisites : Signal & systems

Course Educational Objectives	
CEO1	To understand about the adaptive filters.
CEO2	To study the first-order adaptive algorithm.
CEO3	To study the Linear Prediction and Recursive Order Algorithm.
CEO4	To Analyze the basic adaptive signal processing methods, especially linear adaptive filters.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Understand the basics of digital signal processing and digital filter design and its realizations.
CO2	Analyze the basic adaptive signal processing methods, especially linear adaptive filters.
CO3	Apply important structures of adaptive filters and algorithms.
CO4	Design and integrate an adaptive filter in communication systems.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3		3											
CO2	2	2		3											
CO3	3	2		3											
CO4	2	3		3											
Avg.	2.5	2.5		3											

SYLLABUS

Unit:1 **(8hrs) Introduction to Discrete Random processes**

Random variables, random processes, filtered random processes, Ensemble averages, correlation, covariance, power spectrum, cross power spectrum, Ergodicity, time averages, biased & nbiased estimators, consistent estimators.

Unit:2 **(8 hrs)**

Linear prediction

Direct form linear prediction filtering, Normal equations for linear prediction filtering, Levinson algorithm, Linear prediction lattice filtering.

Unit:3 **(10hrs)**

Digital Wiener filtering

Wiener smoothing and prediction filters, Application of Wiener smoothing to noise cancelling, Application of Wiener prediction filters,Constrained, linear MMSE filtering, Minimum variance beamforming.

Unit:4 **(10 hrs)**

Adaptive Signal Processing

Least mean square algorithm, Recursive least square algorithm, variants of LMS algorithm: SK-LMS, N-LMS, FX-LMS. Adaptive FIR & IIR filters, Application of adaptive signal processing: System identification, Channel equalization, adaptive noise cancellation, adaptive line enhancer.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Digital Signal Processing, Third Edition, Prentice Hall, J.G. Proakis and D.G. Manolakis
2. Adaptive Signal Processing, B. Widrow and Stern
3. Digital Signal Processing, Oppenhein and Schafer.

Reference Books

1.Fundamentals of Adaptive Filtering, Ali H. Sayed, John Wiley, 2003
2. Adaptive Filtering: Algorithms and Practical Implementation, P. Diniz, Kluwer, 1997.

TITLE OF THE SUBJECT

Subject Code	ANTENNA DESIGN & SIMULATION	L	T	P	C	QP
MECPC2032		3	0	0	3	

Pre-Requisites : Fundamentals of electromagnetic theory

Course Educational Objectives	
CEO1	To Design wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro strip antennas.
CEO2	To understand the fields radiated by various types of antennas.
CEO3	To know the different types of arrays and their radiation patterns.
CEO4	To Analyze antenna measurements to assess antenna's performance.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Illustrate the different types of arrays and their radiation patterns.
CO2	Analyze antenna measurements to assess antenna's performance.
CO3	Quantify the fields radiated by various types of antennas.
CO4	Design wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro strip antennas.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3												
CO2	3	2	3												
CO3	2	2	3												
CO4	2	3	2												
Avg.	2.5	2.5	2.75												

SYLLABUS

Unit:1 **(8hrs)**

Radiation process, mechanism of radiation of EM energy from a dipole and horn (concept only) radiation pattern, Antenna parameters (concept and expressions) Radiation equation, pattern, beam width, aperture, effective height, antenna field region/zone.

Unit:2 **(10 hrs)**

Reciprocity theorem,self impedance and mutual impedance (concepts).Effect of ground plane –image theory, Small loop antenna, Duality theorem and applications. Communication link – receiving and transmitting antenna, electrical equivalent ckt, Point source concept

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane;Slot antenna; Horn antenna; Reflector antenna, Aperture blockage and design consideration.

Unit:3 **(8 hrs)**

Introduction, General structure of phased array, linear array theory, Variation of gain as a function of pointing direction, Effects of phase quantization, frequency scanned arrays, analog beam forming matrices, Active modules, digital beam forming,MEMS technology in phased arrays, Retrodirective and self phased arrays.

Unit:4 **(10 hrs)**

Radiation Mechanism from patch; Excitation techniques,Microstrip dipole; Rectangular patch, Circular patch, and Ring antenna, Radiation analysis from transmission line model, cavity model, Input impedance of rectangular and circular patch antenna. Microstrip array and feed network ,Application of microstrip array antenna, Mobile phone antenna, base station, hand set antenna

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Constantine A Balanis, ”Antenna theory: analysis and design”, Wiley India, 3rd Edition, 2011.

2. Hubregt.J.Visser “Antenna Theory and Applications” 1st Edition, John Wiley & Sons Ltd, Newyork,2012.

Reference Books

1. Zhijun Zhang” Antenna Design for Mobile Devices” 1st Edition, John Wiley & Sons (Asia) Ltd, Newyork,2011.

2. Xavier Begaud, “Ultra Wide Band Antennas” , 1st Edition, ISTE Ltd and John Wiley & Sons Ltd,Newyork,2013.

TITLE OF THE SUBJECT

Subject Code	SEMICONDUCTOR DEVICE MODELING	L	T	P	C	QP
MECPC2033		3	0	0	3	

Pre-Requisites : Physics of Semiconductor device .

Course Educational Objectives	
CEO1	To understand the behavior of the electrical devices based on fundamental physics.
CEO2	To create some compact models (such as the SPICE transistor models).
CEO3	To understand the modeling of devices in integrated circuits .
CEO4	To understand about MOS and bipolar transistor modeling.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Explain the equations, approximations and techniques available for deriving a model with specified properties, for a general device characteristic with known qualitative theory.
CO2	Apply suitable approximations and techniques to derive the model referred to above starting from drift-diffusion transport equations .
CO3	Explain how the equations get lengthy and parameters increase in number while developing a compact model .
CO4	List mathematical functions representing various non-linear shapes.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3		3											
CO2	3	1		3											
CO3	3	2		3											
CO4	2	3		3											
Avg.	2.75	2.25		3											

SYLLABUS

Unit:1 **(8hrs)**

PN Junction Diode and Schottky Diode: DC Current Voltage Circuits, Static Model, Large Signal Model, Small signal Model, Schottky Diode and its Implementation in SPICE 2, Temperature and Area Effect on the Diode Model Parameters, SPICE3, HSPICE & PSPICE Models.

Unit:2 **(10 hrs)**

BJT: Transistor Conversion and Symbols, Ebers-Moll Static, Large Signal and Small Signal Models, Gummel-Poon Static, Large Signal Models, Temperature and Area Effect on the BJT Parameters, Power BJT Models, SPICE3, HSPICE & PSPICE Models

JFET: Static Model, Large Signal Model, Small signal Model and its Implementation in SPICE 2, Temperature and Area Effect on the JFET Model Parameters, SPICE3, HSPICE & PSPICE Models.

Unit:3 **(10hrs)**

Metal Oxide Semiconductor Transistor (MOST): Structure and Operating Regions of the MOST, Level-1 and Level-2 Static Models, Level-1 and Level-2 Large-Signal Models, Comment on the Three Models, The Effect of Series Resistance, Small-Signal Models, The

Effect of Temperature on the MOST Model Parameters, BSIM1 & BSIM2 Models, SPICE3, HSPICE & PSPICE Models.

Unit:4 **(8 hrs)**

Noise and Distortion: Noise, Distortion in MOSEFT, ISFET, THYRISTOR.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Book

1. G. Massobrio and P.Antognetti, *Semiconductor Device Modeling by SPICE*, Second Edition, McGraw Hill, 1993

Reference Book

1. N. Dasgupta and A. Dasgupta, *Semiconductor Device Modeling*, PHI Publication

TITLE OF THE SUBJECT

Subject Code	ADVANCED DIGITAL SIGNAL PROCESSING	L	T	P	C	QP
MECPC2041		3	0	0	3	

Pre-Requisites : Signal & systems, Digital signal processing

Course Educational Objectives	
CEO1	To understand the applications of linear filters and their real-time implementation challenges.
CEO2	To understand about different DSP Processors.
CEO3	To implement linear filters in real-time DSP chips;
CEO4	To represent real world signals in digital format and understand transform-domain representation of the signals

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Learn to represent real world signals in digital format and understand transform-domain (Fourier and z-transforms) representation of the signals
CO2	Introduce applications of linear filters and their real-time implementation challenges.
CO3	Learn to implement linear filters in real-time DSP chips;
CO4	Provide the basic knowledge of different DSP Processors.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3												
CO2	2	3	3												
CO3	3	2	3												
CO4	2	3	3												
Avg.	2.25	2.75	3												

SYLLABUS

Unit:1 **(8hrs)**

INTRODUCTION TO DSP: Signals and their origin- Noise-Classification of continuous time signals- discrete time signals classification and properties of systems- Sampling Theorem sampling-digitizing-aliasing- anti-alias filter - Convolution theorem-linear convolution and circular convolution - Applications of filters - Advantages of DSP

Unit:2 **(10hrs)**

Z-TRANSFORMS: Z-Transform and its properties –Inverse Z-transform –Discrete Fourier Transforms DFT and its properties-Radix 2FFT, Computational advantages of FFT over DFT-13 Decimation in time FFT algorithm-Decimation-in Frequency FFT algorithm

Unit:3 **(8 hrs)**

IIR DIGITAL FILTER DESIGN:Block diagram Representation of digital filter-Basic IIR digital filter structures.

FIR DIGITAL FILTER DESIGN:Basic FIR Filter Structure, Structure realization, FIR Filter design based on windowed Fourier series-Frequency sampling method, equiripple linear, phase FIR filter design

Unit:4 **(10 hrs)**

DSP PROCESSOR- TMS320C5X:Introduction to programmable DSPS- Architecture of TMS 320 C5X, TMS 320C5X Assembly language Instructions-Instruction Pipelining in C5X Programming using DSP Processor: Convolution using MAC and MACD Instructions- Square wave generation-Ramp signal generation- Triangular wave generation.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. John .G.Proakis, "Digital Signal Processing Principles, Algorithms and Applications", Addison – Wesley ISBN-81-203-1129-9, 2002.
2. 1. Sanjit .K. Mitra, "Digital Signal Processing A Computer based approach", Tata McGraw Hill Edition, ISBN 0-07-044705-5, 2001.

Reference Books

1. B.Venkataramani, M Bhasker, "Digital Signal Processors", Tata McGraw-Hill Publishing Company limited, ISBN 0-07-047334-X, 2002.

2. Emmanuel C.Ifeachor, "Digital Signal Processing A Practical Approach", Pearson Education Asia, ISBN 81-7808-609-3, 2002

TITLE OF THE SUBJECT

Subject Code	INTERNET & WEB TECHNOLOGY	L	T	P	C	QP
MECPC2042		3	0	0	3	

Pre-Requisites: Computer architecture & networking

Course Educational Objectives	
CEO1	To study about designing of dynamic web pages using JavaScript.
CEO2	To study about web pages using XHTML and Cascading Styles sheets.
CEO3	To study about XML documents.
CEO4	To analyze a web page and identify its elements and attributes.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Analyze a web page and identify its elements and attributes.
CO2	Create web pages using XHTML and Cascading Styles sheets.
CO3	Build dynamic web pages using JavaScript (client side programming).
CO4	Create XML documents.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2													
CO2	2	2													
CO3	3	3													
CO4	3	2													
Avg.	2.75	2.25													

SYLLABUS

Unit:1 **(8hrs)**

INTRODUCTION : The Internet and WWW Understanding the WWW and the Internet, Emergence of Web, Web Servers, Web Browsers, Protocols, Building Web Sites HTML Planning for designing Web pages, Model and structure for a Website, Developing Websites, Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website

Unit:2 **(10hrs)**

Web Essentials: Clients, Servers and Communications. The Internet-Basic Protocols-The World Wide Web-Http request message-response message Web Clients and Web Servers.HTML5: Basic Tags-Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input types-Form elements, form Attributes.CSS3: Borders-Backgrounds-TextEffects-Fonts-2D and 3D Transforms-Transitions-Animations

Unit:3 **(10hrs)**

JavaScript: An Introduction to JavaScript -Objects in JavaScript: Data and Objects - Built-in objects - Events - DHTML with JavaScript. jQuery: 12 Selectors, Events-jQuery Effects: Hide/Show, Fade ,Animate, stop, callback, chaining-jQuery DOM manipulation

SERVLETS AND JSP Servlets 3.1: Web servers and Java web containers-Lifecycle-content handling-cookies-session tracking-filters- Annotations- Filters-Event handling-Exception Handling -Asynchronous processing -Debugging - Security – Internationalization. Java server pages(JSP) 2.2:Expressions-and declarations-directives-JSP and java beans-include and forward directives-- Standard Tag Library- Database Access- XML - Java Beans - Custom Tags - Expression Language(EL)-JSTL.

Unit:4 **(8 hrs)**

XML: Introduction and Overview-XML Fundamentals-XML Syntax-XML Namespaces-XML Document Type Definitions (DTD)-XML Schema Definition (XSD)-XQuery and Xpath-Presenting XML-XML Transformation with XSLT-XML Parsers:DOM and SAX

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Jeffrey C. Jackson, “Web Technologies: A Computer Science Perspective”, Pearson Education, 2006.

2. Chris Bates, “Web Programming – Building Intranet applications”, Wiley Publications, 3rd Edition, 2009.

Reference Books

.1. Jonathan Chaffer, Karl Swedberg, “Learning jQuery: Better interaction Design and Web Development with Simple JavaScript Techniques”, PACKT publishing, 2007.

2. Deitel, Deitel& Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 4th Edition, 2008. 5. Marty Hall,“Core Servlets and Java Server Pages”, JAVA 2 Platform, Enterprise Edition services

TITLE OF THE SUBJECT

Subject Code	**ADVANCED MICROPROCESSOR & MIRCROCONTROLLER**	L	T	P	C	QP
MECPC2043		3	0	0	3	

Pre-Requisites : Fundamentals of microprocessor & microcontroller.

Course Educational Objectives	
CEO1	To study about the different microprocessor and microcontroller.
CEO2	To design automated system with programming module.
CEO3	To understand the impact of microprocessor based system in process of automation.
CEO4	To understand the microprocessor based data acquisition system.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	State the internal organization of 8086 microprocessor & microcontrollers (8051, PIC).
CO2	Understand the impact of microprocessor based system in process of automation.
CO3	Apply knowledge of soft skill and other resources to design automated system with programming module.
CO4	Conduct experiments for real time data collection by microprocessor based data acquisition system.
CO5	Design interfacing circuits of various devices with the microprocessor and microcontroller.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3		3											
CO2	3	3		3											
CO3	2	2		3											
CO4	2	3		2											
Avg.	2.5	2.75		2.75											

SYLLABUS

Unit:1 **(8hrs)**

INTEL 8086 MICROPROCESSOR: 8086 internal architecture, addressing modes, pin diagram, Minimum mode and maximum mode of operation, timing diagrams, Memory interfacing to 8086 (Static RAM & EPROM), 8086 interrupts and interrupt responses

Unit:2 **(8 hrs)**

8086 PROGRAMMING: Instruction set of 8086, assembler directives, program development Steps, constructing the machine course Codes for 8086 instructions, writing programs for Use with an assembler, writing and using procedures and assembler macros.

Unit:3 **(10hrs)**

PROGRAMMABLE DEVICES AND INTERFACING OF I/O: Priority interrupt controller Intel 8259A, programmable peripheral interface 8255A, USART 8251, KEYBOARD/ DISPLAY CONTROLLER 8279 and DMA Controller 8257

Unit:4 **(10 hrs)**

8051 MICRO CONTROLLER: Overview of 8051 family, Pin description of the 8051, 256-byte on-chip RAM, 8051 flag bits and PSW register, 8051 register banks and stack, instruction set, Programming 8051 timers, counter programming, Basics of serial communication, 8051 serial port programming in Assembly.

PIC MICROCONTROLLER

CPU Architecture, instruction sets, interrupts, Timers,I2C interfacing-UART-A/D converter

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. A.K.Ray and K.M.Bhurchandi, “Advanced Microprocessors and Peripherals”, 2nd Edn, TMH, 2006.

2. Mazidi and Mazidi, “The 8051 Microcontroller and Embedded Systems”, 2nd Edn, PHI, 2004.

Reference Books

.1. Barry B. Brey, “The Intel Microprocessors-Architecture, Programming & Interfacing”, 6th Edn., Pearson Education, 2004.

4. Raj Kamal “Microcontrollers Architecture, Programming, Interfacing and System Design”, 1st Edn., Pearson Education, 2005.

TITLE OF THE SUBJECT

Subject Code	NETWORK SECURITY & CRYPTOGRAPHY	L	T	P	C	QP
MECPE2051		3	0	0	3	

Pre-Requisites : Computer networking

Course Educational Objectives	
CEO1	To understand the information security awareness and its importance.
CEO2	To master fundamentals of secret and public cryptography.
CEO3	To be exposed to original research in network security.
CEO4	To be familiar with network security threats and countermeasures.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	To be familiar with information security awareness and a clear understanding of its importance,
CO2	To master fundamentals of secret and public cryptography
CO3	To be familiar with network security threats and countermeasures,
CO4	To be exposed to original research in network security

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2													
CO2	2	2													
CO3	3	2													
CO4	2	2													
Avg.	2.5	2													

SYLLABUS

Unit:1 **(8hrs)**

NETWORK SECURITY: Authentication Application – Kerbros – Email Security – PGP – Network Security – IPSec – Web Security – SSL – SET. UNIT V- SYSTEM SECURITY (9 hours) Intrusion Detection – Password management – Malicious software – Viruses and countermeasures – Firewall Types and Configurations – Trusted System

Unit:2 **(8 hrs)**

Security Services, Mechanisms and Attacks – Network Security Model-Classical Encryption Techniques – Steganography – Data Encryption Standard (DES).

Unit:3 **(10hrs)**

ADVANCED BLOCK CIPHERS AND PUBLIC KEY CRYPTOSYSTEMS: Block cipher modes operation – Overview of IDEA, Blowfish, RC5, CAST-128 – Characteristics of advanced symmetric Block ciphers – Key Distribution – Principle – RSA algorithm – Public Key Management – DiffieHellmen Key Exchange – X.509 Public Key Certificate Format.

Unit:4 **(10 hrs)**

MESSAGE AUTHENTICATION AND DIGITAL SIGNATURE: Message Authentication codes – MAC – HASH function – Principle of MD5, SHA-1 and HMAC algorithms-Digital Signature algorithm.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1.Forouzan.B.A. andMukhopadhyay.D, "Cryptography and Network Security", Tata Mc-Graw Hill, 2nd Edition, 2010.

2.William Stallings, "Cryptography and Network Security", Pearson Education, 5th Edition, New Delhi, 2011.

Reference Books

1. . William Stallings, "Cryptography and Network Security", PHI, New Delhi, 2nd Edition, 1999.

TITLE OF THE SUBJECT

Subject Code	RF MEMS FOR WIRLESS COMMUNICATION	L	T	P	C	QP
MECPE2052		3	0	0	3	

Pre-Requisites : RF components & basics of filters

Course Educational Objectives	
CEO1	To understand the limitations of the RF MEMS technology for wireless applications.
CEO2	To design practical RF MEMS devices using analytical and numerical techniques
CEO3	To design high-performance circuits and sub-systems using RF MEMS components
CEO4	To understand the simple linear and non-linear mechanical, electromagnetic and electromechanical models of RF MEMS structures

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Learn the modeling and designing of MEMS inductors and capacitors.
CO2	Design micro machined RF filters.
CO3	Understand the operation of RF MEMS relays and switches.
CO4	Understand the design of oscillators.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3		3											
CO2	2	2		3											
CO3	3	2		3											
CO4	3	3		3											
Avg.	2.75	2.5		3											

SYLLABUS

Unit:1 **(8hrs)**

INTRODUCTION

Spheres of wireless activities, the home and office, the ground fixed/mobile platform, the space platform, wireless standards, systems and architectures, wireless standards, conceptual wireless systems, wireless transceiver architectures, power and bandwidth-efficient wireless systems & challenges, MEMS based wireless appliances enable ubiquitous connectivity. Physical aspects of RF circuit design, skin effect,transmission lines on thin substrates, self-resonance frequency, quality factor packaging, practical aspectsof RF circuit design, dc biasing, and impedance mismatch effects in RF MEMS.

Unit:2 **(10hrs)**

ENABLED CIRCUIT ELEMENTS

RF/Microwave substrate properties, Micro machined – enhanced elements – capacitors, inductors, varactors, MEM switches – shunt MEM switch, low voltage hinged MEM switch approaches, push-pull series switch, folded – beam – springs suspension series switch

RESONATORS & ENABLED CIRCUITS

Transmission line planar resonators, cavity resonators, micromechanical resonators, film bulk acousticwave resonators, MEMS modeling – mechanical modeling, electromagnetic modeling. Enabled circuits –reconfigurable circuits – the resonant MEMS switch, Capacitors, inductors, tunable CPW resonator,MEMS micro switch arrays,

Unit:3 **(10hrs)**

RECONFIGURABLE CIRCUITS

Double – stud tuner, Nth – stub tuner, filters, resonator tuning system, massively parallel switchable RFfront ends, true time-delay digital phase shifters, Reconfigurable antennas – tunable dipole antennas,tunablemicrostrip patch-array antenna. Phase shifters- fundamentals, X-Band RF MEMS Phase shifter forphased array applications, Ka-Band RF MEMS Phase shifter for radar systems applications

Unit:4 **(8 hrs)**

FILTERS & OSCILLATORS

Film bulk acoustic wave filters – FBAR filter fundamentals, FBAR filter for PCS applications, RF MEMSfilters – A Ka-Band millimeter-wave Micromachined tunable filter, A High-Q 8-MHz MEM Resonatorfilter, RF MEMS Oscillators – fundamentals, A 14-GHz MEM Oscillator, A Ka- Band Micromachinedcavity oscillator, A 2.4 GHz MEMS based voltage controlled oscillator.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Book

1. Hector J. De Los Santos, “RF MEMS Circuit Design for Wireless Communications”, Artech House,2002.

Reference Books

1. Vijay K.Varadan, K.J. Vinoy, K.A. Jose., “RF MEMS and their Applications”, John Wiley and sons,LTD, 2002.

2. Gabriel M. Rebeiz, “RF MEMS Theory, Design & Technology”, Wiley Interscience, 2002

TITLE OF THE SUBJECT						
Subject Code	**ADVANCED ANTENNAS FOR WIRELESS COMMUNICATION**	L	T	P	C	QP
MECPE2053		3	0	0		

Pre-Requisites : Basics of antenna theory & mobile communication

Course Educational Objectives	
CEO1	To introduce about various wireless channel models
CEO2	To understand various antennas & their operations.
CEO3	To understand the design issues in spread spectrum and multi user communication systems

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	To provide comprehensive knowledge of different design and performance parameters of antenna.
CO2	To provide the overall idea about various existing antennas and different advance antennas presently in practice.
CO3	To provide principle of operation, analysis and application of different antennas such as microstrip antenna, smart antenna, etc.
CO4	Determine the type and appropriate model of wireless fading channel based on the system parameters and the property of the wireless medium.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2													
CO2	2	2													
CO3	3	2													
CO4	2	3													
Avg.	2.5	2.25													

SYLLABUS

Unit:1 **(8hrs)**

Fundamental Parameters of Antenna and cellular concepts:

Radio communication link with transmission and receiving antenna, radiation patterns, antenna equivalent circuits reciprocity theorem, beam area, beam width, directivity, gain, antenna apertures, effective height, field zones, radiation resistance, radiation efficiency, antenna polarization. Potential functions and the elect electric dipole-derivations for E and H field systems in spherical co-ordinate systems, power radia current element, Principal operation of a cellular mobile system, analogue and digital cellular

Unit:2 **(10hrs)**

Mobile antennas and mobile Radio Propagation and Modeling: Introduction and basics of mobile radio propagation, free-space propagation model, link budget design, propagation models, types of small-scale fading, statistical models for multipath propagation. Antennas fo Mobile Communication: Mean effective gain, Human body interactions and specific absorption rate, mobile satellite antennas, Macrocell antennas, microcell antennas, Picocell

antennas, femtocell antennas, space diversity antennas.

Introduction to Smart Antennas:
Need for smart antennas, standards for smart antennas, types of smart antennas, features and benefits ,architecture, advantages and disadvantages of smart antennas, introduction to orthogonal signals, signal propagation: multipath and co-channel Interference

Unit:3 **(10hrs)**
Introduction to Smart Antennas: Spatial Processing for Wireless Systems :

The Vector Channel Impulse Response and the Spatial Signature, Spatial Processing Receivers, Fixed Beam forming networks, Switched Beam Systems.

Adaptive Antenna Systems:
Wideband Smart Antennas, Spatial Diversity, Diversity Combining, and Sectoring, Transmission Beam forming, Array Calculation

Smart Antennas Techniques for CDMA:
Non-Coherent CDMA Spatial Processors, Coherent CDMA Spatial Processors and the Spatial Processing Rake Receiver, Multi-User Spatial Processing, multi-carrier communication, Dynamic Re-sectoring Using Smart Antennas, Downlink Beam-forming for CDMA

Unit:4 **(10 hrs)**
CDMA System Range and Capacity Improvement Using Spatial Filtering:
Range Extension in CDMA, Reverse Channel Performance of Multi-cell Systems with Spatial Filtering at the Base Station, Range and Capacity Analysis Using Smart Antennas – A Vector Based Approach

RF Position Locating Systems: Direction finding PL systems, True ranging PL Systems, Elliptical PL Systems, Hyperbolic PL Systems, Hyperbolic Vs DF PL Systems, TDOA Estimation Techniques: General Model for TDOA Estimation, Measures of Position Location Accuracy: Circular Error Probability and Geometric Dilution of Precision.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Constantine A Balanis, ”Antenna theory: analysis and design”, Wiley India, 3rd Edition, 2011.
2. 1. Zhijun Zhang” Antenna Design for Mobile Devices” 1st Edition, John Wiley & Sons (Asia) Ltd, Newyork,2011.
3. T. S. Rappaport, Wireless digital communications: Principles and practice, 2nd Ed., Prentice Hall India, 2007.

Reference Books

1. Balanis, C.A., "Antenna Theory and Design", 3rd Ed., John Wiley & Sons. 2005
2. W. C. Y. Lee, Wireless and cellular telecommunications, 3rd Ed., MGH, 2006.