GALGOTIAS UNIVERSITY

Syllabus of

Electronics and Communication Engineering(B.Tech)

Name of School: School of Electrical, Electronic and Communication Engineering

Department: Electronic and Communication Engineering

Year: 2016-20

ECE 2016-2020

First Semester						
Sl. No.	Course Code	Course Title	L	T	P	C
1	LLL111	Basic English	0	0	4	2
2	MAT113	Differential and Integral Calculus	3	0	0	3
3	PHY111	Modern Physics	3	0	0	3
4	PHY151	Physics Lab - I	0	0	2	1
5	CHY111	General Chemistry	3	0	0	3
6	CHY151	Chemistry Lab - I	0	0	2	1
7	EVS102	Environmental Science & Energy	0	0	2	1
8	EEE101	Basic Electrical and Electronics Engineering	3	0	0	3
9	EEE151	Basic Electrical and Electronics Engineering Lab	3	0	0	3
10	MEE152	Workshop Practice	0	0	2	1
Total Credits						

Second Semester						
Sl. No.	Course code	Course Title	L	T	P	C
1	MAT122	Matrices & Ordinary Differential Equations	3	0	0	3
2	PHY121	Condenced Matter Physics	3	0	0	3
3	PHY141	Physics Lab II	0	0	2	1
4	LLL101	Universal Human Values & Ethics	0	0	2	1
5	LLL123	English Proficiency and Aptitude Building-I	0	0	4	2
6	HUM201	Psychology & Sociology	3	0	0	3
7	CHY122	Nanoscience & Nanotechnology	3	0	0	3
8	CSE101	Computer Programming & Problem Solving	3	0	0	3
9	CSE151	Computer Programming and Problem Solving Lab	0	0	2	1
10	MEE151	Engineering Graphics	0	0	2	1
11	CHY141	Chemistry – II Lab	0	0	2	1
Total Credits						

Third Semester						
Sl. No.	Course Code	Course Title	L	T	P	C
1	MAT212	Vector Calculus, Functions of Complex Variable & PDE	3	1	0	4
2	LLL213	English Proficiency and Aptitude Building-2	0	0	4	2
3	ECE211	Data Structures Using 'C'	3	0	0	3
4	ECE251	Data Structures Using 'C' Lab	0	0	2	1
5	ECE213	Electromagnetic Field Theory	3	0	0	3
6	ECE212	Electronic Devices and Circuits	3	0	0	3
7	ECE214	Signals and Systems	3	0	0	3
8	EEE211	Network Analysis and Synthesis	3	0	0	3
9	EEE251	Network Analysis and Synthesis Lab	0	0	2	1
10	ECEP217	PBL-1	0	0	2	1
Total Credits						24

Fourth Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	ECE225	Computer Organization and Architecture	3	1	0	4
2	MAT222	Numerical Methods	3	0	0	3
3	MAT241	Numerical Methods LAB	0	0	2	1
4	LLL222	English proficiency and Aptitude Building-3	0	0	4	2
5	ECE222	Measurement and Instrumentation	3	0	0	3
6	ECE226	Analog Communication	3	0	0	3
7	ECE246	Analog Communication Lab	0	0	2	1
8	ECE221	Digital Design	3	0	0	3
9	ECE241	Digital Design Lab	0	0	2	1
10	ECE223	Computer Networks	3	0	0	3
11	ECEPB248	PBL-2	0	0	2	1
Total Credits						25

Fifth Semester						
Sl. No.	Course Code	Course Title	L	T	P	C
1	ECE311	Analog Integrated Circuit	3	0	0	3
2	ECE351	Analog Integrated Circuits Lab	0	0	2	1
3	ECE312	Microprocessors and Microcontrollers	3	0	0	3
4	ECE352	Microprocessors and Microcontrollers Lab	0	0	2	1
5	ECE313	Digital Communication	3	0	0	3
6	ECE353	Digital Communication Lab	0	0	2	1
7	ECE316	Control Systems	3	0	0	3
8	LLL312	English proficiency and Aptitude Building-IV	0	0	4	2
9	ECE331/ECE317	Digital System Design using VHDL/ Automation and Robotics (Program Elective-1)	3	0	0	3
10	ECE314/ ECE315	Embedded System Design/ VLSI Technology (Program Elective-2)	3	0	0	3
11	ECE332	Electronics and Communication Engineering Project Based Learning-III	0	0	2	1
12	ITS318	IT Skills in C and C++ Programming				
Total Credits						

Sixth Semester

Sl. No.	Course code	Course Title	L	T	P	C
1	ECE329	Microwave Engineering	3	0	0	3
2	ECE355	Microwave Engineering Lab	0	0	2	1
3	ECE327	VLSI Design	3	0	0	3
4	ECE347	VLSI Design Lab	0	0	2	1
5	ECE326	Digital Signal Processing	3	0	0	3
6	ECE346	Digital Signal Processing Lab	0	0	2	1
7	ECE342	ECE Project based Learning IV	0	0	2	1
8	ITS319	IT Skills in Databases	0	0	2	1
9	ECE324	Antenna and Wave Propagation	3	0	0	3
10	LLL322	Campus to Corporate	0	0	4	2
11	ECE328/ ECE319	Mobile Ad Hoc Networks/ Satellite Communication (Program Elective-3)	3	0	0	3
12	ECE314/ ECE613	Embedded System Design/ Soft Computing (Program Elective-4)	3	0	0	3

Total Credits	25

Seventh Semester						
Sl. No.	Course Code	Course Title	L	T	P	C
1	ECE413	Wireless and Mobile Communication	3	0	0	3
2	ECE612/ ECE412	Mobile Computing/ Digital Image Prosecing Program Elective-5	3	0	0	3
3	MGT302	Industrial Economics and Management	3	0	0	3
4	ECE418	Technical proficiency in Electronics and Communication Engineering-III	0	0	2	1
5	ECE411	Optical Communication and Networks	3	0	0	3
6	ECE451	Optical Communication and Networks Lab	0	0	2	1
	ECE350	ECE-Industrial internship	0	0	0	2
7	ECE419	Capstone Design-I	0	0	10	5
Total Credits						21

Eighth Semester						
Sl. No.	Course Code	Course Title	L	T	P	C
1	ECE429	Capstone Design-II	0	0	30	15
Total Credits						15

Name of The Course	Basic Electrical and Electronics Engineering				
Course Code	EEE101				
Prerequisite	Basic Number System, Basic Electronics				
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop solid foundation for further study of electrical and electronics courses
2. To develop the analytical skills for solving the electrical and electronics circuits
3. To learn the utility of basic electronics devices and circuits
4. To understand the basic principles of electrical machines

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Course Outcomes

CO1	Summarize the basic network theorems and laws, Boolean algebra, BJT characteristics, principle of different types of electrical machines
CO2	Solve and analyze transient and steady state of AC and DC network, phasors, representation and conversion of data, Synthesis of logic circuits, BJT and diode biasing, wave shaping circuits and operation of the machines
CO3	Apply the AC and DC theorems and laws in networks circuits, Boolean algebra, BJT characteristics, operation of the machines
CO4	Demonstrate AC and DC network circuits using network theorems and laws, Boolean logic circuits, BJT biasing and its characteristics, connections and testing of the machines
CO5	Understand transformer and motor basic characteristic and working

Text Book :

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical and Electronics Engineering”, McGraw Hill, 20016.
1. V. Mittle and Arvind Mittle, “Basic Electrical Engineering”, McGraw Hill, 2005.
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, 9th Edition, Pearson Education, 2007.
3. A. P. Malvino and Donald Leach, “Digital Principles and Applications”, 6th Edition, Tata McGraw Hill, 2006.

Reference Books

1. D. C. Kulshreshtha,”Basic Electrical Engineering”, Tata McGraw Hill, 2009.
2. J. Edminister and M. Nahvi , “Electric Circuits”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2002.
3. Jacob Millman, Christos C. Halkias, Satyabrata Jit, “Electronics Devices and Circuits”, 3rd Edition, Tata McGraw Hill, 2008

Course Content:

Unit-1 Elementary Circuit Analysis 8 hrs Ohm's law, KCL, KVL, node voltage analysis, mesh current, circuits with independent sources, Thevenin's & Norton's equivalent, maximum power transfer and superposition theorem.
Unit II: 8 hrs
Analysis of DC and AC Circuits RL and RC transients in circuits with DC source, RMS values, the use of phasors for constant frequency sinusoidal sources, steady state AC analysis of a series circuit, parallel circuits, AC power calculations.
Unit-III 8 hrs
Digital Systems Basic logic circuit concepts, Basic Gates and Universal Gates, representation of numerical data in binary form – Binary to decimal, Octal, Hexadecimal, Boolean algebra, combinational logic circuits-Half adder, full adder, synthesis of logic circuits, minimization of logic circuits.
Unit IV 8 hrs
Semiconductor Devices Basic diode concepts, ideal diode model, rectifier and wave-shaping circuits, zener diode voltage regulator concepts, bipolar junction transistors, current and voltage relationship, common emitter characteristics.
Unit V: 8 hrs
Electro-mechanics Transformers-Ideal and real transformers, Construction, Principle of operation of transformer, E.M.F Equation, Phasor diagram of transformer, Losses, efficiency. D.C Machines-Construction, principles of rotating DC machines, Types of Excitations-separately excited and self excited (shunt, series and compound) DC machines. Three phase induction motors-Construction, Principle of operation, synchronous speed, slip, and frequency of rotor emf. Synchronous Machines-construction, principle of operation of synchronous motor and applications.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Electromagnetic Field Theory				
Course Code	ECE213				
Pre-requisite	Engineering Mathematics				
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

- To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials
- To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To understand wave propagation in lossless and in lossy media
- To be able to solve problems based on the above concepts

Course Outcomes:

CO1	Apply coordinate systems and transformation techniques to solve problems on Electromagnetic Field Theory
CO2	Apply the concept of static electric field and solve problems on boundary value problems.
CO3	Analyze the concept of static magnetic field and solve problems using Biot - Savart's Law, Ampere's circuit law, Maxwell's equation.
CO4	Understands magnetic forces, magnetic dipole and magnetic boundary conditions.
CO5	Understands the time-varying Electromagnetic Field and derivation of Maxwell's equations.

Reference Books

1. Principles of Electromagnetics N. O. Sadiku, Oxford University Press Inc
2. Engineering Electromagnetics W H Hayt, J A Buck, McGraw Hill Education
3. Electromagnetic Waves, R.K. Shevgaonkar, Tata McGraw Hill India, 2005
4. Electromagnetics with Applications, Kraus and Fleish, Edition McGraw Hill International Editions, Fifth Edition, 1999Syllabus

UNIT I STATIC ELECTRIC FIELDS
Introduction to Co-ordinate System – Rectangular –Cylindrical and Spherical Co- ordinate System – Introduction to line, Surface and Volume Integrals – Definition of Curl, Divergence and Gradient – Meaning of Stokes theorem and Divergence theorem Coulomb's Law in Vector Form – Definition of Electric Field Intensity – Principle of Superposition – Electric Field due to discrete charges – Electric field due to continuous charge distribution – Electric Field due to charges distributed uniformly on an infinite and finite line – Electric Field on the axis of a uniformly charged circular disc – Electric Field due to an infinite uniformly charged sheet.Electric Scalar Potential – Relationship between potential and electric field – Potential due to infinite uniformly charged line – Potential due to electrical dipole – Electric Flux Density – Gauss Law – Proof of Gauss Law – Applications
UNIT II: STATIC MAGNETIC FIELDS
The Biot-Savart Law in vector form – Magnetic Field intensity due to a finite and infinite wire carrying a current I –Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere's circuital law and simple applications. Magnetic flux density The Lorentz force equation for a moving charge and applications, Force on a wire carrying a current I

placed in a magnetic field – Torque on a loop carrying a current I – Magnetic moment – Magnetic Vector Potential.
UNIT III: ELECTRIC AND MAGNETIC FIELDS IN MATERIALS
Poisson's and Laplace's equation – Electric Polarization-Nature of dielectric materials- Definition of Capacitance – Capacitance of various geometries using Laplace's equation– Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law – continuity equation for current.Definition of Inductance – Inductance of loops and solenoids – Definition of mutual inductance – simple examples. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability – magnetic boundary conditions
UNT IV: TIME VARYING ELECTRIC AND MAGNETIC FIELDS
Faraday's law – Maxwell's Second Equation in integral form from Faraday's Law – Equation expressed in point form.Displacement current – Ampere's circuital law in integral form – Modified form of Ampere's circuital law as Maxwell's first equation in integral form – Equation expressed in point form. Maxwell's four equations in integral form and differential form.Poynting Vector and the flow of power – Power flow in a co-axial cable – Instantaneous Average and Complex Poynting Vector.
UNIT V: ELECTRO MAGNETIC WAVES
Derivation of Wave Equation – Uniform Plane Waves – Maxwell's equation in Phasor form – Wave equation in Phasor form – Plane waves in free space and in a homogenous material.Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect. Linear, Elliptical and circular polarization – Reflection of Plane Wave from a conductor – normal incidence – Reflection of Plane Waves by a perfect dielectric – normal and oblique incidence. Dependence on Polarization, Brewster angle.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Electronic Devices and Circuits				
Course Code	ECE212				
Prerequisite	Physics,Modern Physics				
Corequisite	Physics				
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives: To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

Course Outcomes

CO1	Realize the transistor biasing methods and Design analog electronic circuits using discrete components
CO2	Design common amplifier circuits and analyze the amplitude and frequency responses
CO3	Design various analog circuits to analyze their responses
CO4	Understand the principle of operation of different Oscillator circuits.
CO5	Understand the principle of operation of various amplifier circuits

Text Book (s):

1. Jacob. Millman, Christos C.Halkias, 'Electronic Devices and Circuits', Tata McGraw Hill Publishing Limited, New Delhi, 2008, ISBN 0070634556, 9780070634558.
2. Jacob Millman and C. Halkias, 'Integrated Electronics – Analog and Digital Circuits and Systems', Tata Mc Graw Hill, 2001, ISBN 0074622455, 9780074622452
3. Electronic Devices & Circuits Theory – Robert Boylestad and Louis Nashelsky, 10th EditionPrentice Hall, 2009, ISBN 0135026490, 9780135026496

Reference Book (s):

1. Jacob Millman and Arvin Grabel, 'Microelectronics', McGraw Hill, 2001, ISBN 0074637363, 9780074637364.
2. Electronic Devices & Circuits – David. A. Bell, 3rd Edition, Prentice – Hall, 1986 ISBN 083591559X, 9780835915595Syllabus

Unit-1 Introduction 8 hours
BJT and BJT Biasing .Hybrid models of CE, CB, CC, configurations – Study of the effect of emitter by- pass condenser at low frequencies - Hybrid – π common emitter transistor model – hybrid π conductance and capacitance – CE short circuit current gain – current gain with resistive load – gain bandwidth product – Study of the effect of un bypassed emitter resister on amplifier performance, Cascode amplifier. HF & LF compensation of RC coupled amplifier. Multistage Amplifiers.
Unit-2 8 hours
FET and FET Biasing. FET Amplifiers: Common source, Common gate and Common drain Amplifiers – problems. Small signal analysis of FET Amplifiers. High Frequency analysis of FET Amplifiers, VMOS & CMOS Concepts.

Unit-3	8 hours
The feedback concept – Transfer gain with feedback – general characteristics and advantages of negative feedback– analysis of voltage series, Voltage shunt, current series and current shunt feedback amplifiers – Study of the effect of Negative feedback on Gain, Bandwidth, Noise, Distortion, Input and Output impedances with the help of Block Schematic and Mathematical Expressions	
Unit-4	8 hours
Sinusoidal oscillators –phase shift oscillator – Wien bridge oscillator – Hartley oscillator – Colpits oscillator – frequency stability, inclusive of design, Crystal oscillators.	
Unit-5	8 hours
Characteristics of Tuned amplifiers – Analysis of Single tuned, Doubled tuned and stagger tuned amplifiers, Gain – bandwidth product – High frequency effect – neutralization. Power Amplifiers: Classification of amplifiers – class A large signal amplifiers – second harmonic distortion – higher order harmonic generations – computation of Harmonic distortion – Transformer coupled audio power amplifier – efficiency – push - pull amplifier – class B amplifier – class AB operation – Push-Pull circuit with Transistors of Complimentary Symmetry.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Signals and Systems			
Course Code	ECE214			
Pre-requisite	Engineering Mathematics			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

This subject is about the mathematical representation of signals and systems. The most important representations we introduce involve the *frequency domain* – a different way of looking at signals and systems, and a complement to the time-domain viewpoint. Indeed engineers and scientists often think of signals in terms of frequency content, and systems in terms of their effect on the frequency content of the input signal. Some of the associated mathematical concepts and manipulations involved are challenging, but the mathematics leads to a new way of looking at the world.

Course Outcomes:

CO1	Understand about various types of signals, classify them, analyze them, and perform various operations on them.
CO2	Understand about various types of systems, classify them, analyze them and understand their response behaviour
CO3	Appreciate use of transforms in analysis of signals and system.
CO4	Carry simulation on signals and systems for observing effects of applying various properties and operations.
CO5	Create strong foundation of communication and signal processing to be studied in the subsequent semester

Text Book:

1. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi, ISBN 1259083349, 9781259083341

Reference Books

1. Signals and Systems by Oppenheim & Wilsky Millman

Unit I: Introduction to Signals 9 Hours
Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships),exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables)
Unit II :Introduction to Systems 8 Hours
Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability, convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density.
Unit III: Fourier Transforms (FT) 10 Hours
Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT, Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.

Unit IV: Laplace-Transform (LT) and Z-transform (ZT) 10 Hours
One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC), One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping
Unit V: Time and frequency domain analysis of systems 8 Hours
Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Network Analysis and Synthesis				
Course Code	EEE211				
Pre-requisite	Basic Electrical and Electronics Engineering				
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

1. To learn the concepts of network analysis in electrical and electronics engineering.
2. To learn linear circuit analysis, graph theory and network theorems.
3. Analyze two port networks using Z, Y, ABCD and h parametersa

Course Outcomes:

CO1	Analyze an electric network using graph theory
CO2	Solve the electric networks using different network theorems e.g. Thevenin's theorem, superposition theorem and maximum power transfer theorem etc
CO3	Synthesize an electric network using driving point and transfer functions
CO4	Analyze LTI systems using two ports networks
CO5	Design active and passive filter circuits

Text Books

1. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. A C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers, 2007,
3. D.RoyChoudhary, "Networks and Systems" Wiley Eastern Ltd.

Reference Books

1. M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
2. A.Chakrabarti, "Circuit Theory" DhanpatRai& Co

Unit I: Graph Theory 8 Hours
Loop and Nodal methods of analysis, Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality.
Unit II: Network Theorems (Applications to ac networks) 10 Hours
Super-position theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem.
Unit III: Network Functions and Transient analysis 9 Hours
Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, transient analysis of ac & dc systems.
Unit IV : Two Port Networks 8 Hours
Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, T & Π Representation.
Unit V: Network Synthesis & Filters 9 Hours
Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, high pass, (constant K type) filters, and introduction to active filters.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Analog Communication				
Course Code	ECE226				
Prerequisite	Signals And Systems, Principles of Basic Electronic Circuits				
Corequisite					
Antirequisite					
		L	T	P	C
		3	1	0	3

Course Objectives:

1. Concepts of communication engineering.
2. Different analog modulation techniques used.
3. Effects of noise and interference.
4. Systematic comparison of various modulation techniques.

Course Outcomes

CO1	Understand the basics of communication system and analog modulation techniques
CO2	Apply the basic knowledge of signals and systems and understand the concept of Frequency modulation.
CO3	Apply the basic knowledge of electronic circuits and understand the effect of Noise in communication system and noise performance of AM system
CO4	Interpret the effect of noise performance of FM system
CO5	Realize TDM and Pulse Modulation techniques

Text Book (s)

1. Simon Haykin, “Communication Systems”, 4th edition, John Wiley & Sons, 2006, ISBN 812650904X, 9788126509041.
2. J. Proakis& M. Salehi, “Communication system engineering”, 2nd edition, Prentice Hall, 2002, ISBN 0130617938, 9780130617934
3. Simon Haykin, “Digital Communication”, 3rd Edition, John Wiley and Sons, 2008, ISBN 8126513667, 9788126513666.
4. Bernard Sklar, "Digital Communication”, Pearson Education India 2009, ISBN 8131720926, 9788131720929

Course Content:

Unit-1Basics of Communication Theory 8 hrs
Need and Importance of Communication, Elements of Communication System, Generalized block diagram of communication system, Types of communication systems- Simplex and Duplex systems, Analog and digital systems, Applications of Electronic Communications, Electromagnetic Spectrum used in communication and various frequency bands, Concept of bandwidth. Noise in communication and types of noise (External and Internal), Noise voltage, Signal-to-noise ratio, Noise Figure, Noise temperature.
Unit-2Amplitude Modulation 8 hrs
Concept of modulation and demodulation, baseband and pass band signals. Amplitude Modulation (AM)- generation & demodulation, Modified forms of AM- Double sideband suppressed carrier (DSBSC), single sideband suppressed carrier (SSBSC) and Vestigial sideband (VSB) modulation, Mixers, Frequency Division Multiplexing.

Unit-3Angle Modulation	8 hrs
Phase modulation (PM) and Frequency modulation (FM), narrow and wideband FM, Generation & demodulation, phase locked loop (PLL), homodyne and heterodyne receivers, elements of TV broadcast and reception.	
Unit-4Noise in CW modulation	8 hrs
Receiver model, signal to noise ratio (SNR), noise figure, noise temperature, noise in DSB-SC, SSB, AM & FM receivers, pre-emphasis and de-emphasis.	
Unit-5Pulse Modulation	8 hrs
Sampling Process, Basics of Pulse modulation, Types of Pulse Modulation – PAM, PWM and PPM.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Analog Integrated Circuit				
Course Code	ECE311				
Pre-requisite	Basic Electrical and Electronics Engineering				
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

Course Outcomes:

CO1	Illustrate the AC, DC characteristics and compensation techniques of Operational Amplifier
CO2	Realize the applications of Operational Amplifiers
CO3	Clarify and Analyze the working of Analog Multipliers and PLL
CO4	Classify and realize the working principle of various converter circuits using Op-Amps
CO5	Demonstrate the function of various signal generators and Waveform Shaping Circuits

Text Books:

1. Sergio Franco, " Design with operational amplifiers and analog integrated circuits ", McGraw Hill, 2002, ISBN 0070530440, 9780070530447
2. Ramakant A. Gayakwad, " OP - AMP and Linear IC's ", 4th Edition, Prentice Hall, 2000, ISBN 0132808684, 9780132808682

Reference Books:

1. Botkar K.R., " Integrated Circuits ", Khanna Publishers, 1996.
2. Taub and Schilling, " Digital Integrated Electronics ", Tata McGraw-Hill Education, 2004, ISBN 0070265089, 9780070265080
3. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001, ISBN 0074622455, 9780074622452Syllabus.

Unit I: Operational Amplifiers	8 Hours
Analysis of difference amplifiers, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate, Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers.	
Unit II: Applications of Operational Amplifiers	10 Hours
Differentiator, Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.	

Unit III: Analog Multiplier and PLL	8 Hours
Analysis of four quadrant and variable trans-conductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs.	
Unit IV: D/A and D/A Converters	9 Hours
Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter- Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.	
Unit V: Signal generators & Waveform shaping Circuits	8 Hours
Wave shaping circuits, Multivibrator- Monostable & Astable, Schmitt Trigger circuits, IC 555 Timer, Application of IC 555, Switched capacitor filter, Frequency to Voltage converters.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Digital Communication			
Course Code	ECE313			
Pre-requisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Difference between analog and digital communication systems, and compare their respective advantages and disadvantages.
2. Performance limitation, detection and estimation in digital communication system.
3. Waveform coding techniques and the design and use of A/D convertors or D/A convertors.
4. Role of Digital Modulation and Demodulation techniques in different application.
5. Use of spreading of signals and multiple access schemes

Course Outcomes:

CO1	Analyze the theanalyze the digital communication systems wrt entropy and channel capacity calculation
CO2	Identify various types of error introduced in the processes viz. sampling, quantizing, and ISI
CO3	Investigate pulsed modulation system and analyze their system performance
CO4	Analyze different digital modulation schemes and can compute the bit error performance
CO5	To apply spread spectrum techniques to the need of secure the data transmission
CO6	Understand the recent trends in communication.

Text Books

1. Simon Haykin, “Digital Communications”, Wiley student edition- 1988, ISBN 978-81-265-0824-2

2. Bernard Sklar, “Digital Communication”, 2nd Edition, Pearson Education,edition- 2006, ISBN-10: 0130847887.

Reference Books

1. John.G. Proakis, “Fundamentals of Communication Systems”, Pearson Education, 2006, ISBN 978-81-317-05735

2. Amitabha Bhattacharya, “Digital Communications”, Tata McGraw Hill, 2006, ISBN: 978-0-07-059117-2.

3. Herbert Taub& Donald L Schilling – Principles of Communication Systems (3rd Edition) – Tata McGraw Hill, 2008, ISBN 0070648115.

4. Michael. B. Purrsley, “Introduction to Digital Communication”, Pearson Education, 2006, ISBN 978-0-07-2957 I6-7,4th edition.

Unit- I: Communication System & Information Theory
Introduction to Digital Communication; Basic building blocks of digital communication, GSOP, Mutual information, Information and Channel Capacity, Entropy, Shano- Fano and Huffman’s Coding, Overview of Sampling, Quantization – Uniform and Non-uniform (A-law & μ-law). Classification of line codes, characteristics and power spectra of line codes.

Unit – II: Baseband Transmission
Baseband data Transmission Systems: Baseband and Bandpass transmission through AWGN channel, Coherent and noncoherent receiver structures, Error Probability, Pulse Shaping, M-ary Signalling Schemes, Matched Filter, Correlation receiver, Equalization, ISI, Eye Pattern analysis.
Unit – III: Waveform Coding Techniques
Pulse-Code modulation (PCM), Quantization Noise and Signal-to-noise Ratio, Differential-PCM, Delta Modulation and Adaptive delta-Modulation
Unit – IV: Modulation Schemes
Digital Modulation Schemes, ASK, PSK, DPSK, FSK, QPSK, QAM and MSK systems, Probability of Error in Digital Modulation Schemes, Continuous Phase Carrier Modulation, Differential modulation schemes, receiver structure and error performance, Performance comparison of modulation schemes.
Unit – V: Spread Spectrum & Multiple Access Techniques
Introduction – Generation of PN Sequences – Properties of PN Sequences – Direct Sequence Spread Spectrum – Frequency Hopped Spectrum. Introduction to Multiple Access– TDM/TDMA – FDM/FDMA – CDMA – SDMA - OFDM/OFDMA.
Unit- VI: Emerging Trends in Communication
Introduction to Emerging Trends, Cloud Services, 5G

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Control Systems			
Course Code	ECE316			
Pre-requisite	Engineering Mathematics			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

Study of Open loop & closed control; servomechanism, Transfer functions, Block diagram algebra, Signal flow graph, time response of first and second order systems, time response specifications, dynamics of linear systems, and frequency domain analysis and design techniques. Constructional and working concept of ac servomotor, synchronous and stepper motor, their characteristics, performance. The Routh-Hurwitz, root-locus, Bode, and Nyquist techniques. Design and compensation of feedback control systems. Diagonalization, Controllability and observability and their testing.

Course Outcomes:

CO1	Summarize different control system and solve transfer function, block diagram and signal flow diagram reduction of control system.
CO2	Design and solve control system engineering problems in time response of first and second order systems.Analyze concept of ac servomotor, synchronous and stepper motor and and understand Stability and Algebraic Criteria concept of stability and necessary conditions
CO3	Applying concept of ac servomotor, synchronous and stepper motor and understand Stability and Algebraic Criteria concept of stability and necessary conditions
CO4	Demonstrate & analyse frequency response analysis for stability by polar and inverse polar plots, Bode plots, Nyquist stability criterion, gain margin and phase margin
CO5	Realize the design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain, diagonalization, Controllability and observability and their testing

Text and Reference Books

1. Nagrath&Gopal, “Control System Engineering”, 4th Edition, New age International.
2. 2. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
3. 3. B.C. Kuo & FaridGolnaraghi, “Automatic Control System” Wiley IndiaLtd, 2008.
4. N.C. Jagan, “Control Systems”, B.S. Publications,2007. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
5. D.RoyChoudhary, “Modern Control Engineering”, Prentice Hall of India.

. Course Content:

Unit-1 Introduction to Control Systems 8 hours
Open loop & closed control system, servomechanism, Physical examples. Transfer functions, Block diagram algebra, and Signal flow graph, Mason’s gain formula Reduction of parameter variation and effects of disturbance by using negative feedback.
Unit-2 Time Response of feedback control systems 8 hours
Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants. Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices.
Unit-3 Stability analysis 8 hours

Routh-Hurwitz criteria and limitations, root locus concepts, construction of root locus. Constructional and working of ac servomotor, synchronous and stepper motor.
Unit-4 Frequency domain analysis and stability 8 hours
Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.
Unit-5 Introduction to Digital Control System 8 hours
The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Microwave Engineering				
Course Code	ECE329				
Pre-requisite	Electromagnetic field theory				
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. Concept of scattering parameters used to characterize devices and system behavior.
2. The high frequency behavior of circuit and network elements as well as the analysis and the design of active and passive microwave devices.

Course Outcomes:

CO1	Illustrate the basic concepts of microwave transmission lines.
CO2	Identify and use microwave guides and components.
CO3	Apply the conceptual knowledge of microwave solid state technology and traveling wave tube techniques
CO4	Distinguish between microwave solid state and technology and traveling wave tube techniques
CO5	Demonstrate and evaluate the microwave measurement techniques.

Text Book

1.D.M.Pozar, “Microwave engineering”, John Wiley, 3/e, 2005
2. Samuel Y.Liao, “Microwave Devices and Circuits”, 3/e, PHI, New Delhi,1987.

Reference Books

1. Rober.E.Collin, “Foundations of Microwave Engineering”, John Wiley, 3/e, 2001
2. Annapurna Dasand S,.K.Das, “Microwave Engineering”, Tata Mc Graw-Hill, New Delhi, 2000
3. R.Chatterjee, “Microwave Engineering”, Affiliated East west Press PVT Ltd, 2001
4. O.P.Gandhi, “Microwave Engineering”, Pergamon Press, NY, 1983

Unit – I: Introduction
Microwave frequency, Applications of Microwave, microwave transmission line, Introduction to Micro strip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL.
Unit – II: Microwave waveguides and components
Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant (TE10) mode, Power Transmission, Power losses, Excitation of modes, Circular Waveguides: TE, TM modes, Microwave cavities (Resonators), Scattering matrix- The transmission matrix, Passive microwave devices: Microwave Hybrid Circuits, E Plane Tee, H plane Tee and Magic Tee , Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Isolators, Circulators.
Unit – III: Microwave Semiconductor Devices
Operation, characteristics and application of BJTs and FETs, Principles and characterstics: -tunnel diodes, Varactor diodes, PIN diode, Schottky diodes, Transferred Electron Devices : Gunn diode(Gunn Effect, RWH theory, two valley model theory, modes of operation), Avalanche Transit time devices: IMPATT and TRAPATT devices.
Unit – IV: Microwave linear-beam tubes (O TYPE) and microwave crossed-field tubes (M TYPE)

Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process, Output Power and Beam Loading, Multicavity Klystron Amplifiers, Beam-Current Density, Output Current Output Power of Two-Cavity Klystron, Reflex Klystrons, Velocity Modulation, Power Output and Efficiency, Helix Traveling-Wave Tubes (TWTs), Slow-Wave structures, Amplification Process, Convection Current, Axial Electric Field, Wave Modes, Gain Consideration, Microwave Crossed-Field Tubes , Magnetron Oscillators, Cylindrical Magnetron, Coaxial Magnetron, Tunable Magnetron , Backward wave Oscillators
Unit – V: Microwave Measurements
Introduction, Microwave Measurements devices: Slotted line carriage, Tunable detectors, VSWR Meter, microwave power measurements techniques, frequency measurement, wavelength measurements, Impedance and Refection coefficient measurements, VSWR, Insertion and attenuation measurements: Power ratio method, RF substitution method, VSWR measurements (Low and High)

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	VLSI Design			
Course Code	ECE327			
Pre-requisite	Semiconductor Devices, Integrated Circuits, Digital Design			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To bring both Circuits and System views on design together.
2. Study the fundamental concepts and structures of designing digital VLSI systems include CMOS devices and circuits.
3. Understand standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis.
4. It offers a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design.

Course Outcomes

CO1	Utilize the subject knowledge in specifying the technological problems for evolving cellular technology.
CO2	Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
CO3	Have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.
CO4	Be able to design and solve complex problems.
CO5	Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.
CO6	Design and analyse architectures and functional blocks.

Unit-1 Integrated Circuit: Fabrication And Characteristics 7 hours
Integrated circuit technology, basic monolithic integrated circuits, epitaxial growth, Masking and etching, diffusion of impurities, transistors for monolithic circuits, monolithic diodes, Integrated resistors, Integrated capacitors and inductors, monolithic circuit layout, additional isolation methods, LSI and MSI, the metal semiconductor contacts.
Unit-2 Introduction to MOS Transistor 8 Hours
The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS, Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances, Numerical and spice simulations.
Unit-3 MOS Inverters: Static and Switching Characteristic, Interconnect Effects 10 Hours
Introduction, Resistive-Load Inverter, Inverters with n-Type MOSFET Load, CMOS Inverter, Delay-Time Definitions, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of

Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters, Numerical and spice simulations
Unit-4 Combinational and Sequential MOS Logic Circuits 7 Hours
Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, High-Performance Dynamic CMOS Circuits, Introduction, MOS Logic Circuits with Depletion nMOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates (Pass Gates), Introduction, Behavior of Bistable Elements, The SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop
Unit-5 Memories and VLSI Design Methodologies 7 Hours
Introduction, Read-Only Memory (ROM) Circuits, Static Read-Write Memory (SRAM) Circuits, Dynamic Read-Write Memory (DRAM) Circuits Introduction, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality, VLSI Design Styles, Design Quality, Packaging Technology, Computer-Aided Design Technology
UNIT 6 IMPLEMENTATION STRATEGIES 6
Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Digital Signal Processing			
Course Code	ECE326			
Pre-requisite	Signals and System, Engineering Mathematics			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Introduce to discrete time signal processing and characterization of random signals, filter design techniques, and imperfections caused by finite word length.
2. Learn how design FIR and IIR filters.
3. Learn the theory of digital signal processing and digital filter design, including hands-on experience with important techniques involving digital filter design and digital simulation experiments
4. Introduce the fundamental principles and techniques of digital signal processing for understanding and designing new digital signal processing systems and for continued learning.

Course Outcomes:

CO1	Apply Digital Signal Processing fundamentals.
CO2	Acquire the knowledge of representation of discrete-time signals in the frequency domain,using z-transform and discrete Fourier transform
CO3	Learn the basic forms of FIR and IIR filters.
CO4	Design filters with desired frequency responses
CO5	Understand the concept of linear prediction and spectrum estimation.

TEXT BOOKS

1. Proakis J. G. and Manolakis D. G., "Digital Signal Processing: Principles, Algorithms And Applications", Pearson Education, 3rd Ed., 2003

2. Babu Ramesh P., "Digital Signal Processing", SciTech Publication, 41FL Ed., 2008.

REFERENCE BOOKS

1. Mitra Sanjit K., "Digital Signal Processing: A Computer Based Approach", 3rd Ed., Tata McGraw-Hill, 2008.

2. Oppenhein A. V. and Shafer R. W., "Discrete-Time Signal Processing", PHI, 2nd Ed., 2000.

3. Shaliwahan S., Vallavaraj A. and Gnanapriya C., "Digital Signal Processing", Tata McGraw-Hill, 2nd Ed., 200

UNIT I SIGNALS AND SYSTEMS
Basic elements of DSP, concepts of frequency in Analog and Digital Signals, sampling theorem, Discrete–time signals, systems, Analysis of discrete time LTI systems, Z transform, Convolution, Correlation.
UNIT II FREQUENCY TRANSFORMATIONS
Introduction to DFT, Properties of DFT, Circular, Convolution , Filtering methods based on DFT, FFT Algorithms, Decimation–in–time Algorithms, Decimation–in–frequency Algorithms, Use of FFT in Linear Filtering, DCT, Use and Application of DCT.
UNIT III IIR FILTER DESIGN

Structures of IIR, Analog filter design, Analog Low Pass Butterworth Filter, Analog Low Pass Chebyshev Filter, Comparison Between Butterworth Filter And Chebyshev Filter, Frequency Transformation In Analog Domain, Design Of High Pass, Bandpass And Bandstop Filters, Design Of IIR Filters From Analog Filters, Approximation Of Derivatives, Design Of IIR Filter Using Impulse Invariance Technique, Design Of IIR Filter Using Bilinear Transformation, Frequency Transformation In Digital Domain.
UNIT IV FIR FILTER DESIGN
Structures of FIR, Linear phase FIR filter, Frequency Response Of Linear Phase FIR Filters, Location Of The Zeros Of Linear Phase FIR Filters, The Fourier Series Method Of Designing FIR Filters, Design Of FIR Filter Using Windows, Digital Differentiator, Hilbert Transformers, Frequency Sampling Method Of Designing FIR Filters, Optimum Equi-ripple Approximation Of FIR Filters.
UNIT IV INTRODUCTION TO DSP PROCESSORS
Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Registrar, Index Registrar, Auxiliary Register Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Antenna and Wave Propagation				
Course Code	ECE324				
Pre-requisite	Electromagnetic Field Theory				
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

Antenna and Wave Propagation is to introduce to the students the basics of radiating elements and effect of propagation of radio waves in actual environment. This course provides students with comprehensive coverage of a wide variety of antennas and propagation topics related to numerous communication systems with a particular emphasis on military applications. The course presents fundamental theory together with techniques for the practical design, measurement and application of antennas over the RF (radio-frequency) to millimetre wave frequency range

Course Outcomes

CO1	Write parametric integral expressions for a given current source.
CO2	Approximate parametric equations for the calculation in the far field region.
CO3	Calculate electromagnetic fields for a given vector potential A.
CO4	Discover pattern multiplication principle for array antennas.
CO5	Determine directions of maximum signal radiations and the nulls in the radiation patterns.
CO6	Design array antenna systems from specifications.

Text Book (s)

1. J.D.Krauss, "Antenna for all Applications", TMH, 3rd Edition, 2010, ISBN 0-89006-513-6.
2. C.A.Balanis, "Antenna Theory – Analysis and Design", Third Edition, John Wiley & Sons, 2010. ISBN 0-471-66782-X

Reference Book (s)

1. R.S.Elliot, "Antenna Theory and Design", IEEE Press, John Wiley, 2005, ISBN-13 978-0-470-01741-8, 3rd edition.
2. K.D.Prasad, "Antennas and Radiating Systems", Satyaprakasan

Unit-1Antenna Fundamentals 9 hours
Retarded potential – Radiation mechanism, directivity and gain, bandwidth, polarization, co polarization and cross polarization level, beam width, input impedance, bandwidth, efficiency, input impedance, antenna effective length and area, antenna temperature- radiation pattern- Gain- Directivity and Impedance measurements.
Unit-2Design of Arrays 6 Hours
Linear Array – Two element array, N-element linear array- broadside array, End fire array-Directivity, radiation pattern. Planar array – array factor, beam width, directivity. Circular array –array factor.
Unit-3Design of Antennas 9 Hours
Long wire, V-Antenna, Rhombic antenna, Monopole Antenna – dipole antenna, helical antenna, Spiral antenna, Log periodic antenna, Yagi-Uda antenna. Aperture antenna – Horn antenna, parabolic reflector antenna. Micro-strip antenna.
Unit-4Antennas for modern wireless communications 7 Hours

Antennas for Terrestrial mobile communication – mobile handsets and base stations. Antennas for Satellite Communication- MSAT briefcase terminal and vehicle mounted Antennas.
Unit-5Wave Propagation 8 hours
Propagation Mechanism- Reflection, refraction and Transmission, Scattering and diffraction. Propagation Model- Path Loss, Free space loss, Plane earth Loss. Noise Modeling. Modes of propagation- Ground wave Propagation, Sky wave Propagation, Space wave, Tropospheric Refraction, Obstruction Loss, Diffraction, Influence of Clutter. – Tropospheric effects, Ionospheric Effects
Unit 6 Emerging Technologies 5 hours
Latest Trends and Technologies

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Wireless and Mobile Communication			
Course Code	ECE413			
Pre-requisite	Computer Networks, Analog and Digital Communications			
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objective: This course builds an understanding of the core issues encountered in the design of wireless (vs wired) networks. It also exposes students to fairly recent paradigms in wireless communication.

Course Outcomes:

CO1	Utilize the subject knowledge in specifying the technological problems for evolving cellular technology.
CO2	Educate students to understand the bandwidth of operation of cellular technology and plan spectrum deployment for cellular systems to provide better customer services as well as earn revenue of service provider
CO3	Apply the mobile and wireless principles for creating solutions for data and voice communication in various Industries like Banking, Marketing and Automobile.
CO4	Understand the Modulation and Equalization Techniques
CO5	Understand the needs of technological solution for designing and developing next generation cellular technology to fulfill the ever growing service demands of customer

Text Book (s)

1. Theodore S. Rappaport, “wireless communications Principles and Practices”, PHI, 2005
2. Jochen Schiller, “Mobile Communications”, Pearson Education, second edition, 2009.

Reference Book (s)

1. Lee W.C.Y, “Mobile communication Engineering Theory and Applications”, 2/e McGraw-Hill,New York, 2003
2. Andreas F. Molisch, “Wideband Wireless Digital Communication”, Pearson Education 2001.
3. R. Blake, “Wireless Communication Technologies,” Thomson Delmer, 2003
4. Schwartz, "Mobile Wireless Communications", Cambridge University Press.2003

Unit-1 Introduction of Wireless Communication8 hours 8 Hours
History and evolution of mobile radio systems. Types of mobile wireless services/systems-Cellular, WLL, Paging, Satellite systems, Future trends in personal wireless systems.
Unit-2 Cellular Concepts and System Design Fundamentals 10 Hours
Cellular concept and frequency reuse, channel assignment, handoff strategies, Interference and system capacity, Trunking and GOS, cell splitting, cell sectoring.
Unit-3 Mobile radio Propagation Models 8 Hours
Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse respond models, parameters of mobile multipath channels, Antenna systems in mobile radio.
Unit-4 Modulation, Equalization & Diversity Techniques 8 Hours
Overview analog and digital modulation techniques, GMSK, QAM, OFDM, Spread spectrum modulation, Equalization, Rake receiver concepts, Diversity Techniques, channel coding.
Unit-5 Multiple Access Techniques, Wireless Systems & Standards 7 Hours
Multiple Access Techniques-FDMA, TDMA and CDMA systems, Introduction to 2G,3G and emerging technologies.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100