Program Structure and Syllabus of B. Tech II Year to IV B.Tech (I & II Semesters)

ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

R22 Regulations

ANURAG UNIVERSITY
Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
Hyderabad, Telangana, INDIA
info@anurag.edu.in; http://anurag.edu.in

B.TECH II YEAR I SEMESTER [5 T + 3 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A53008	BS	Numerical Techniques & Complex Variables	3	0	0	3
2	A53013	ES	Electronic Devices & Circuits	3	0	0	3
3	A53021	PC	Signals and Systems	3	1	0	4
4	A53022	BS	Introduction to Probability Theory and Statistics	2	1	0	3
5	A53023	ES	Object Oriented Programming through Java	2	0	2	3
6	A53207	ES	Electronic Devices & Circuits Lab	0	0	3	1.5
7	A53208	PC	Signals and Systems Lab	0	0	3	1.5
8	A53209	HS	Soft Skills for Success Lab	0	0	2	1
9	A53007	MC	Environmental Studies	2	0	0	0
			TOTAL	**15**	**02**	**10**	**20**

B. TECH II YEAR II SEMESTER [5 T + 3 P + 1 M]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A54018	PC	Electronic Measurements and Instrumentation	3	0	0	3
2	A54019	PC	Electro Magnetic Theory and Transmission Lines	3	1	0	4
3	A54020	PC	Pulse & Integrated Circuits	3	0	0	3
4	A54006	PC	Digital Circuits	2	1	0	3
5	A54021	PC	Electronic Circuit Analysis	3	0	0	3
6	A54211	PC	Electronic Circuit Analysis Lab	0	0	2	1
7	A54212	PC	Pulse & Integrated Circuits Lab	0	0	3	1.5
8	A54213	PC	Digital Circuits Simulation Lab	0	0	3	1.5
9	A54022	MC	Gender Sensitization	2	0	0	0
TOTAL				**16**	**02**	**08**	**20**

B.TECH III YEAR I SEMESTER 5T+ 3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	A55020	PC	Analog Communication Systems	3	0	0	3
2	A55021	PC	Microprocessors & Microcontrollers and Interfacing	2	1	0	3
3	A55022	PC	Linear Control Systems	2	1	0	3
4	A55023	PC	VLSI Design	3	0	0	3
5	A55080 A55093 A55041	OE	**Open Elective – I** 1. Entrepreneurship Development 2. Fundamentals of Engineering Materials 3. Mobile Application Development	3	0	0	3
6	A55206	PC	Analog Communication Systems Lab	0	0	2	1
7	A55207	PC	Microprocessors & Microcontrollers and Interfacing Lab	0	0	3	1.5
8	A55208	PC	VLSI Design Lab	0	0	2	1
9	A55091	MC	NSS/NSO	2	0	0	0
10	A55288	HS	LRQA	0	0	3	1.5
Total				**15**	**02**	**10**	**20**

III YEAR II SEMESTER 5T+3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	A56026	HS	Project Management	3	0	0	3
2	A56027	PC	Digital Communication	2	1	0	3
3	A56028	PC	Digital Signal Processing	3	1	0	4
4	A56029	PC	Embedded Systems & IOT	3	0	0	3
5	A56030 A56031 A56032	PE	**Professional Elective-I** 1. CPLD &FPGA Architectures 2. Computer Organization and Operating System 3. Computer Networks	3	0	0	3
6	A56206	PC	Digital Signal Processing Lab	0	0	3	1.5
7	A56207	PC	Embedded Systems & IOT Lab	0	0	3	1.5
8	A56230	HS	Skills Integrated English Lab	0	0	2	1
Total				**14**	**02**	**08**	**20**

IV YEAR I SEMESTER **6T+2L**

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	A57040	PC	Microwave & Radar Engineering	3	0	0	3
2	A57041	PC	Cellular & Mobile Communication	2	1	0	3
3	A57042	PE	**Professional Elective –II** 1. Digital Image Processing	3	0	0	3
	A57043		**2.** Software Defined Radio				
	A57044		3. Low power VLSI				
4	A57045	PE	**Professional Elective –III** 1. Machine Learning & Artificial Neural Networks	3	0	0	3
	A57046		2. Analog VLSI Design				
	A57047		3. Advanced Communications & Networks				
5	A57048	PE	**Professional Elective –IV** 1. Antenna Theory & Design	3	0	0	3
	A57049		2. Optical Communication				
	A57050		3. Bio-Medical Signal Processing and Telemedicine				
6	A57051	PE	**Professional Elective-V** 1. Adaptive Signal Processing	3	0	0	3
	A57052		2. Organic and Flexible Electronics				
	A57053		3. Satellite Communication				
7	A57207	PC	Microwave & Digital Communication Lab	0	0	2	1
8	A57208	PC	Cellular & Mobile Communication Lab	0	0	2	1
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
Total				**17**	**01**	**08**	**22**

IV YEAR II SEMESTER

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	A58002 A58016 A58014	OE	**Open Elective –II** 1. Intellectual Property Rights 2. Python Programming 3. Disaster Preparedness and Planning	2	1	0	3
2	A58017 A58050 A58018	OE	**Open Elective –III** 1. Introduction to Deep Learning 2. OS for Automotive Applications 3. Green Technologies	2	1	0	3
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva -Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
6	A58501	IE	Industry Elective (MOOCS)	0	0	6	3
Total				**4**	**2**	**24**	**20**

NUMERICAL TECHNIQUES & COMPLEX VARIABLES

(Common to ECE &EEE)

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53008	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Course Objectives

Course Objectives of Numerical Techniques & Complex Variables are to:

1. Determine the approximate solutions of algebraic and transcendental equations using iterative methods and interpolate the values for the given data.
2. Finding the integration of given data points with various step sizes by using numerical methods and also determine the solution of linear first order initial value problems using single and multi-step methods.
3. To introduce the basic functions, Differentiation and integration of complex valued functions.
4. Evaluation of integrals using Cauchy's integral formula and series expansion of complex functions.
5. Determine residues and use the residue theorem to compute several kinds of real integrals

Course Outcomes

At the end of this Numerical Techniques & Complex Variables course, students will be able to:

1. Solve the algebraic and transcendental equations using numerical methods and also finding the polynomial using given set of tabulated values and estimation of the functional value within the data by Interpolation.
2. Apply the method of Numerical Integration for engineering problems and also solve the first order initial value problems using Taylor's, Euler and Runge-Kutta methods.
3. Analyze the complex functions with reference to their analyticity and finding the harmonic function. Apply complex analysis in the study of mechanics of solids and liquids, thermodynamics, electrical fields etc
4. Find the integral value by Cauchy's integral formula and also the Taylor's and Laurent's series expansion of complex functions.
5. Apply Residue theorem which is an elegant theorem in complex integration and useful in evaluating complicated real integrals.

UNIT I

Introduction: **Solution of Non- linear Equations:** Solution of Algebraic and Transcendental Equations – The Bisection Method – The Method of False Position – Newton-Raphson Method.

Interpolation: Introduction- Finite differences (Forward and Backward differences), Newton's forward and backward difference interpolation formulae, Lagrange's Interpolation formula.

UNIT II

Numerical integration: Newton's-cotes Quadrature formula, Trapezoidal rule, Simpson's 1/3rd and 3/8 rules.

Numerical solution of Ordinary Differential Equations: Solution by Taylor's series-Picard's Method of successive Approximations- Euler and modified Euler's methods –Runge-Kutta Method.

UNIT III

Functions of a complex variable: Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions, Construction of analytic functions using Milne – Thompson method.

UNIT IV

Complex Integration – Power series: Line integral, Evaluation along a path and by indefinite integration, Cauchy's integral theorem, Cauchy's integral formula, Generalized integral formula. Radius of convergence, Expansion in Taylor's series, Maclaurin's series and Laurent series.

UNIT V

Contour Integration: Singularities: Poles and Residues, Evaluation of residues by formula and by Laurent series, Residue theorem.
Evaluation of integrals of the type

(a) $\int_C^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ (b) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$

TEXT BOOK

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2006.

REFERENCE BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-
Graw Hill, 2004.

3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
5. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

6. Spiegel, Murray R, Schaum's Complex Variables.B. S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers

ELECTRONIC DEVICES AND CIRCUITS

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53013	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Prerequisite: APPLIED PHYSICS

Course Objectives

1. To learn the characteristics of diode and how to make use of diode in different applications
2. To explain the operation and characteristics of transistors in different modes
3. To apply different biasing methods to make transistor stable
4. To explain the operation and design of FET amplifiers.
5. To analyse feedback amplifiers

UNIT I

P-N JUNCTION DIODE AND RECTIFIERS: Review of P-N Junction Diode Volt-Ampere Characteristics, Transition and Diffusion Capacitances, Diode Equivalent Circuits, The P-N Junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Inductor Filters, Capacitor Filters, Voltage Regulation Using Zener Diode. Zener Diode Characteristics.

UNIT II

BIPOLAR JUNCTION TRANSISTOR AND FIELD EFFECT TRANSISTOR: The Junction Transistor, BJT Operation, Common Base, Common Emitter and Common Collector Configurations, Transistor as an Amplifier. The Junction Field Effect Transistor Pinch –Off Voltage –Volt –Ampere Characteristics, MOSFET Operation, MOSFET Characteristics in Enhancement and Depletion Modes.

UNIT III

TRANSISTOR BIASING AND STABILIZATION: Operating Point, The DC and AC Load Lines, Need for Biasing, Types of biasing methods: Fixed Bias, Collector Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against Variation in V_{BE} and β, Bias Compensation Using Diodes and Transistors. Thermal Runway, Thermal Stability.

UNITIV

BJT AND FET AMPLIFIERS: BJT Hybrid Model, Determination of h-Parameters from Transistor Characteristics, Comparison of CB, CE and CC Amplifier

Configurations. The JFET Small Signal Model, FET Common Source Amplifier, Common Drain Amplifier, FET as Voltage Variable Resistor, Comparison of BJT and FET, The Uni-junction Transistor

UNIT V

FEED BACK AMPLIFIERS: Concepts of feedback. Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Problems.

TEXT BOOKS

1. Integrated Electronics Analog and digital circuits and systems– J. Millman,C.C.Halkias, and SatyabrataJit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition,2006.
3. Introduction to Electronic Devices and Circuits- Rober T. Paynter PE,2005.
4. Electronic Devices and Circuits – A. P. Godse Technical Publications.2009.

REFERENCE BOOKS

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 2003.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 2001.
4. Electronic Devices and Circuits – Dr. K. Lal Kishore,2004,BSP

Course Outcomes

After completing the course, students should be able to

1. Apply the diode concepts in different applications
2. Understand the BJT, FET and revolutionary MOSFET that lead to the development of integrated circuits and study their construction and characteristics
3. Compare different biasing methods and compensation methods to make transistor stable
4. Design and analyse simple basic amplifiers using Hybrid model.
5. Design and analyse feedback amplifiers using BJTs

SIGNALS AND SYSTEMS

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53021	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisite: MATHEMATICS-I

Course Objectives

1.To understand signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms
2.To understand sampling theorem, with time and frequency domain analysis of discrete time signals using DTFT and Z transforms.
3.To analyze signals in time domain using convolution sum and integral.
4. To analyze Linear Time Invariant (LTI) Systems in time and Frequency domains.

UNIT I

Classification of Signals and Systems:

Definition and classification of signals-Continuous, Discrete, Periodic, Aperiodic, Deterministic, Random, Even, Odd, Energy and Power, Elementary Signals-Step, Ramp, Impulse, Sinusoidal, Signum, Real and Complex Exponentials, Operations on Signals-Addition, Multiplication, Scaling, Shifting, Folding, Convolution & Correlation. Definition and classification of systems- Continuous, Discrete, Linear, Non Linear, Causal, Non Causal, Stable, Unstable, Time variant, Time Invariant, LTI systems.

UNIT II

Analysis of Continuous Time Signals

Fourier Series for periodic signals, Properties of Fourier Series, Dirichlet's Conditions, Trigonometric & Exponential Fourier Series, Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals, Laplace Transform-Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standard signals.

UNIT III

LTI Continuous Time Systems

Impulse response, Convolution integrals, difference equations, Analysis of continuous time LTI system using Fourier and Laplace transforms, Distortion less transmission through a system, Bandwidth of systems, relation between bandwidth and rise time.

UNIT IV

Analysis of Discrete Time Signals

Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Fourier transform of Discrete time signals (DTFT)-Properties, Z Transform-Definition , ROC , Properties , Inverse Z transform.

UNIT V

LTI Discrete Time Systems

Impulse response, Convolution sum, difference equations, Analysis of discrete time LTI system using Fourier and Z transforms, recursive and non recursive discrete time systems.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.1997.

REFERENCES

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition,2008.
2. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
3. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.Publications, 2nd Edition, 2005.

Course Outcomes

Up on completion of the course, the student will be able to:

1. Define, represent and differentiate types of signals and systems in continuous, discrete time domains and can perform various mathematical operations on them.
2. Compute/Evaluate Fourier series of periodic signals and determine Fourier transform of various signals.
3. Analyze the properties of continuous time signals and systems using Laplace & Fourier transforms and determine the response of LTI system to known inputs.
4. Illustrate signal sampling and its reconstruction.
5. Analyze the properties of discrete time signals and systems using DTFT & Z transforms and determine the response of LTI system to known inputs.

INTRODUCTION TO PROBABILITY THEORY AND STATISTICS

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53022	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Course Objectives

1. To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering.
2. To introduce students to the basic methodology of “probabilistic thinking” and to apply it to problems;
3. To understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
4. To learn statistics which is art of learning from data and its analysis
5. To apply estimation method to predict unknown population parameter.

UNIT I

PROBABILITY: Probability Introduced through Sets, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Introduced through Axioms, Probability Introduced through Relative Frequency, classical definition of Probability, Mathematical Model of Experiments, Joint Probability, Conditional Probability, Total Probability, Bayes’ Theorem, Independent Events.

UNIT II

RANDOM VARIABLE AND OPERATIONS ON SINGLE RANDOM VARIABLE: Definition of a Random Variable, Types of Random Variables, Conditions for a Function to be a Random Variable, Distribution and Density functions, Examples-Binomial, Poisson, Uniform Gaussian, Conditional Distribution and Conditional Density function,Expected Value of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Moment Generating Function.

UNIT III

MULTIPLE RANDOM VARIABLES AND OPERATIONS ON MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution and Joint Density Functions , Marginal Distribution and Marginal Density Functions, Statistical Independence, Conditional Distribution and Density functions, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected),Expected Value of a Function of Joint Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Moment Generating Function, Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties,

UNIT IV

INTRODUCTION TO STATISTICS: Introduction to Statistics: Population and Samples, Describing Data sets, Summarizing Data sets, normal data sets, paired data sets and the

Sample correlation coefficient, mean, mode, median, Sampling Distribution of mean (known and unknown) Proportions, Estimation: Point Estimation, Interval Estimation, Bayesian Estimation

UNIT V

TEST OF HYPOTHESIS: Null Hypothesis, Hypothesis concerning one mean, Hypothesis concerning two means, Estimation of proportions, Hypothesis concerning one proportion, Hypothesis concerning several proportions, Significance tests: student's T-test, F-test, Goodness of fit, Estimation of Proportions, Curve fitting: The method of least squares, Curvilinear Regression, Multiple Regression, correlation for univariate and bivariate Distributions

TEXT BOOKS

1. Introduction to Probability and statistics for engineers and scientists-Sheldon M.Ross, 5th Edition2014.
2. Introduction to Probability and statistics –J.Susan Milton,Jesse C.Arnold,4th Edition, Tata McGraw Hill2009.
3. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.TMH.
4. Probability, Random Variables and Stochastic Processes – Athanasius Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.

REFERENCES

1. Probability and random processes with stochastic processes- Mallikarjuna Reddy Cengae Learning, 4th edition, 2013.
2. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probability Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 2012.
4. Statistical Theory of Communication - S.P. Eugene Xavier, New Age Publications, 2003.
5. Probability and Statistics-Shahnaz Bathul, 2006

Course Outcomes

After completing the course, students should be able to

1. Apply Concepts of probabilities using an appropriate sample space.
2. Apply Simple probabilities and expectations from probability density functions (pdfs) Likelihood ratio tests from pdfs for statistical engineering problems. Least - square & maximum likelihood estimators for engineering problems.
3. Compute the distribution of a function of several random variables.
4. Analyze Statistical Properties such as Mean and variance for sample data.
5. Analyze and minimize the residuals between actual data and observed data

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53023	Core	L	T	P	C	CIE	SEE	Total
		2	0	2	3	50	50	100

Course Objectives

Course Objectives of Object Oriented Programming are to:

1. Impart knowledge of core language features of Java.
2. Appraise the concepts of Inheritance and Polymorphism.
3. Elaborate the use of Packages and Exception Handling.
4. Emphasize collection frameworks and multithreading in Java
5. Familiarize Event Handling and Applets.

Course Outcomes:

At the end of this Object Oriented Programming course, students will be able to:

1. Appraise the basic concepts of java.
2. Implement inheritance and polymorphism.
3. Develop packages and implement exception handling features.
4. Identify usage of collection framework and build multi-threaded applications.
5. Design Applets by using Event Handling features.

UNIT I

Java Basics: History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, static keyword, Garbage collection, Overloading methods and constructors, parameter passing.

UNIT II

Inheritance: Introduction, forms of inheritance- specialization, specification, construction**,** extension, limitation, combination, Member access rules, super uses, using final with inheritance.

Polymorphism: Method overriding, Abstract classes, Object class

UNIT III

Packages and Interfaces: Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, File, Byte Streams, Character Streams.

Exception Handling - Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

UNIT IV

Package java.util- The Collection Interfaces, The Collection classes: LinkedList Class, HashSet Class. TreeSet Class, String Tokenizer, Date, Random, Scanner.

Multi-Threading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT V

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. **Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, create applets, passing parameters to applets.

TEXT BOOK

1. Herbert Schildt, Java- The Complete Reference, Seventh edition, Tata McGraw Hill,2006.

REFERENCE BOOKS

1. Bruce Eckel, Thinking in Java, Fourth Edition, Prentice Hall, 2006.
2. Y. Daniel Liang, Introduction to Java programming, Tenth Edition, Pearson education, 2014.

ELECTRONIC DEVICES AND CIRCUITS LAB

B. Tech II Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53207	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

1. To operate and characterize the behavior of devices and circuits.
2. To understand the functionality of semiconductor devices.
3. To design and test rectifiers with and without filters
4. To design and test amplifiers circuits.
5. Implementation of a few experiments using Arduino.

PART A:

ELECTRONIC WORKSHOP PRACTICE:

Identification, Specifications, Testing of R, L, C, Components (Color Codes),

1. Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specification and Testing of Active Devices, Diodes, BJT's LOW power JFET's, MOSFET's, Power Transistors, LED's, Arduinos, UJT.
3. Study and operation of
   a. Multi-meters (Analog and Digital)
   b. Regulated Power Supplies
   c. Function Generator
   d. CRO

PART B

(For Laboratory Examination – Minimum of 10 experiments)

List of Experiments

1. Forward & Reverse Bias Characteristics of PN Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters

5. Input & output characteristics of Transistor in CB Configuration.
6. Input & output Characteristics of Transistor in CE Configuration.
7. FET characteristics.
8. Measurement of h- parameters of transistor in CB, CE, CC configurations
9. MOS characteristics
10. Current Shunt and Voltage Series Feedback Amplifiers.
11. Frequency Response of FET Amplifier (Common source).
12. Arduino based voltage regulator.
13. Switching circuit with Arduino to control LED
14. UJT Characteristics.

Requirements

1. Regulated power supplies (RPS)
2. CRO's : 0-20MHZ
3. Function Generator : 0-1 MHZ
4. Multimeters
5. Decade Resistance Boxes / Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) : 0-20μA, 0-50μA, 0-100μA, 0-200μA,0-10 mA
8. Voltmeters (Analog or Digital) : 0-50V,0-100V, 0-250V
9. Electronic Components : Resistors, Capacitors, BJTs, LCDs, Arduinos, UJTs, FETs, LEDs, MOSFETs, diodes Ge & Si type, Transistors NPN, PNP type

Course Outcomes

After completing the course, students should be able to

1. Understand electronic test equipment to characterize the behavior of devices and circuits.
2. Plot the characteristics of semiconductor devices to understand their functionality.
3. Design and test rectifiers with filters
4. Design and test amplifier circuits and interpret the results.
5. Design and test of Feedback amplifiers circuits and interpret the results.

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SIGNALS AND SYSTEMS LAB

B. Tech II Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53208	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

List of Experiments (12 Experiments to be done):

Course Objectives

1. To be able to describe signals mathematically and understand how to perform mathematical operations on signals. The operations should include operations on the dependent as well as independent variables.
2. To understand system properties - linearity, time invariance, presence or absence of memory, causality, bounded-input bounded-output stability, and invertability. Be able to identify whether a given system exhibits these properties and its implication for practical systems.
3. To be able to perform the process of convolution between signals and understand its implication for analysis of linear time-invariant systems. Understand the notion of an impulse response.
4. To be able to solve a linear constant coefficient differential equations using Laplace transform techniques.
5. To develop basic problem-solving skills and become familiar with formulating a mathematical problem from a general problem statement.

List of Experiments:

1. Basic operations on matrices.
2. Generation of various signals and sequences (periodic),such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Operation on signal and sequence such as addition, multiplication, scaling, folding, shifting, computation of energy and average power.
4. Finding the even and odd parts of continuous signals/sequences, real and imaginary part of continuous signals/sequences.
5. Convolution between two signals and any two sequences.
6. Auto correlation and cross correlation between two signals and any two sequences.
7. Verification of linearity and time invariance properties of a given continuous /discrete system.
8. Computation of unit sample, unit step and sinusoidal response of the given LTI system and verifying its physical realization and stability properties.

9. Gibbs phenomenon.
10. Finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using Laplace transforms.
12. Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
13. Sampling theorem verification.
14. Removal of noise by auto correlation/ cross correlation.

Requirements

For the basic simulation lab.

1. Computer System with latest specifications.
2. Connected in LAN (Optional)
3. Operating system (Windows XP or higher)
4. MATLAB or SCILAB

Course Outcomes

After completing the course, students should be able to:

1. Describe the basics of MATLAB/SCILAB syntax, functions and programming.
2. Generate and characterize various continuous and discrete time signals.
3. Perform the basic operations on the signals.
4. Design and analyze linear time-invariant (LTI) systems and compute its response.
5. Analyze the spectral characteristics of signals using Fourier analysis, Laplace transform and Z-transform.

SOFT SKILLS FOR SUCCESS LAB

B. Tech II Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53209	Core	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Introduction: The primary focus of the course is to highlight various categories and applications of Soft Skills through various cases taken from the real field and other research case studies. The fundamental concepts and distinctions between Soft Skills and Hard Skills are discussed. The course is tailored very effectively to introduce various Soft Skill application examples.

Course Objectives

To identify and participate in meaningful conversations

Course Outcomes

On successful completion of the course, students will be able to:

1. exhibit communication skills in various situations
2. handle the emotions with peers and classmates
3. demonstrate respect for the opinions, personal space, and beliefs of others
4. connect and work with others to achieve a set task
5. assess and identify the requirements and strengths within the team

UNIT I

Soft Skills Development: An Introductory Overview - Self-Discovery & Goal Setting - Johari Window

UNIT II

Personality Development - Body Language - Etiquette & Manners

UNIT III

Presentation Skills (Individual & Team) Oral & Written - Teamwork & Leadership Qualities

UNIT IV

Debates - Group Dynamics - Dos & Don'ts -Techniques to participate and conclude

UNIT V

Emotional Intelligence - Conflict Management - Stress Management

Minimum requirements of infrastructural facilities for "Soft Skills for Success" Laboratory:

A spacious room with movable chairs, a Public Address System etc.

REFERENCES

1. Butterfield, Jeff. Soft Skills for Everyone**.** New Delhi: Cengage Learning, 2010.
2. Chauhan, G.S. & Sangeeta Sharma. Soft Skills. New Delhi: Wiley, 2016.
3. Goleman, Daniel. Working with Emotional Intelligence. London: Banton Books, 1998.

4. Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley, 2011.
5. Holtz, Shel. Corporate Conversations. New Delhi: PHI, 2007.

ENVIRONMENTAL STUDIES

B. Tech II Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53007	Core	L	T	P	C	CIE	SEE	Total
		2	0	0	0			

PREREQUISITES: Engineering Chemistry

Course Objectives

1. To introduce knowledge about the environment.

2. To introduce students to the concepts of pollution, biodiversity

3. To develop an awareness about global environmental problems.

4. To learn to protect environment and awareness on legal issues

5. To learn about importance of sustainable development and role of IT in environment.

UNIT I

Multidisciplinary nature of environmental studies: Definition, scope and importance – need for public awareness.

Ecosystems: Concept of an ecosystem – classification, structure and function of different ecosystems - producers, consumers and decomposers. - energy flow in the ecosystem - ecological succession - food chains, food webs and ecological pyramids.

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - bio-geographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - hot-spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT II

Natural Resources: Renewable and non-renewable – natural resources and associated problems: forest resources – use and over – exploitation, deforestation,– timber extraction, mining, dams and other effects on forest and tribal people: water resources – use and over utilization of surface and groundwater – floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources. - Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification. role of an

individual in conservation of natural resources: equitable use of resources for sustainable lifestyles.

UNIT III

Environmental pollution: Definition, cause, effects and control measures of different kinds of pollution (Air, Water, Soil, Marine, Noise, Thermal, Nuclear, e – waste)

Carbon capture & sequestration – different storage sources, major disadvantages, environmental effects

Social issues and the environment: From unsustainable to sustainable development - urban problems related to energy -water conservation, rain water harvesting, and watershed management. -climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

UNIT IV

Waste management technology: Solid waste management: causes, effects and control measures of urban and industrial wastes. - role of an individual in prevention of pollution, disaster management: floods, earthquake, cyclone and landslides. wastewater and sewage treatment technology: primary, secondary and tertiary treatments. bioremediation, phyto-remediation, ZLD (zero liquid discharge), membrane technology. application of GIS and GPS system in environmental science.

Environmental policy, rules and regulations. EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act - Wildlife Protection Act –Forest Conservation Act.- Public awareness. global environmental problems and global efforts.

UNIT V

Towards sustainable future: concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. environmental education, conservation of resources. urban sprawl, sustainable cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, basic principles of green engineering, clean development mechanism (CDM), low carbon life cycle, polluters-pay principle.

Course Outcomes

1. Understand fundamental physical and biological principles that govern natural processes.
2. Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.
3. Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems
4. Communicate integrated perspectives on complex environmental problems in the form of written and oral argument to both professional and lay audiences.
5. Design and conduct independent research that contributes to environmental thought and/or problem solving.

TEXT BOOKS:

1. Erach Bharucha.,"Textbook of Environmental Studies for Undergraduate Courses", University Press Private Limited., Reprinted in 2005.
2. Rajagopalan, R., "Environmental Studies: From Crisis to Cure", 2nd ed, Oxford University Press., 2005.

REFERENCES:

1. Richard T.Wright., "Environmental Science: Towards a Sustainable Future",10th ed, PHL Learning Private Ltd, New Delhi., 2008.

2. Gilbert M.Masters, and Wendell P.Ela.,"Environmental Engineering and Science",4th ed, PHI Learning Pvt. Ltd., 2008

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54018	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Prerequisite: Applied Physics

Course Objectives:

1. To develop an awareness to various electronic measurement Concepts
2. To know the operation and design of different electronic instruments
3. To learn the operation of various generators and analyzers
4. To measure using AC and DC bridges
5. To Familiarize with different types of transducers.

UNIT I

Proposed: Block Schematics of Measuring Systems, Performance Characteristics: Static Characteristics: Accuracy, Resolution, Precision, Gauss Error, Types of Errors. Dynamic Characteristics: Repeatability, Reproducibility, Fidelity, Lag.

Analog Measuring Instruments: D' Arsonval Movement, DC Voltmeter and Ammeter, rectifier type AC Voltmeters, Ohmmeters, Multimeter, Extension of Range of voltmeter and ammeter , True RMS Responding Voltmeters. Ramp type DVM, Digit display.

UNIT II

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Delay lines, Dual Beam CRO. Applications, Specifications.

Special purpose oscilloscopes: Sampling oscilloscopes, Storage oscilloscopes, digital Storage CROs, Frequency and Period Measurements. Lissajous Figures, CRO Probes.

UNIT III

Signal Generators: AF Signal Generator, RF Signal Generator, Function Generator, Specifications.

Signal Analyzers: AF Wave Analyzers, HF Wave Analyzers, Heterodyne wave Analyzers, Harmonic Distortion Analyzers, and Spectrum Analyzers.

UNIT IV

Measurements using DC and AC Bridges: Detectors and Generators for bridges. Wheatstone Bridge, Kelvin Bridge, Maxwell, Hay, Anderson Bridges, Schering, Wagner’s ground connection.

UNIT V

Transducer: Classification, Piezoelectric Transducer, Thermocoupler, Resistance Thermometers, Strain gauges: Bonded, unbounded, LVDT, Variable Capacitance Transducers, MEMS.

Measurement of Physical Parameters: Flow, displacement, Pressure, temperature, pH, gases. Data Acquisition Systems.

TEXT BOOKS

1. Electronic Instrumentation: H.S.Kalsi - TMH. Z'a Edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques:A.D. Helbincs. W.D. Cooper: PHI 56 Edition 2003.

REFERENCE BOOKS

1. Electronic Measurements and Instrumentation- K. Lal Kishore, Pearson Education 2010.
2. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint

   2009.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

Course Outcomes

After completing the course, students should be able to

1. Describe the measuring concepts and instrumentation systems.
2. Explain the operation of oscilloscopes
3. Use and various generators and analyzers
4. Apply the measuring concepts using AC and DC bridges
5. Calculate physical parameters.

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54019	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	50	50	100

UNIT I

Sources of electromagnetic fields- Review of Vector calculus, Static electric fields: Coulombs law, Gauss law and electrostatic potential, Magnetostatics: Ampere's law, Magnetic vector potential, self and mutual inductance, Time varying fields, Maxwell's Equations, Boundary conditions at Media Interface.

UNIT II

Electromagnetic Waves: Wave Equation, Uniform plane electromagnetic waves, Propagation of electromagnetic waves in different media, polarization, Continuity equation, Poynting theorem.

UNIT III

Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary

UNIT IV

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

UNIT V

Antennas **:** Introduction, Basic Antenna Parameters-patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain - Resolution, Antenna Apertures, Effective Height, Fields from oscillating dipole, Field zones, shape-impedance considerations, Antenna Temperature, Front to back ratio, Antenna Theorem. Wave Propagations **-** Introduction, Definitions, categorizations and general classifications, different modes of wave propagation

TEXT BOOKS

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 4th ed., 2001.
2. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
3. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Pearson, 2nd Edition 2015
4. Antennas and wave propagation – John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, TMH 4th Edn.,(Special Indian edition) 2010.

REFERENCE BOOKS

1. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech.India Publications), New Delhi, 2001
2. Narayana Rao, N: Elements of Engineering Electromagnetics, Pearson, 6th Edition 2006.
3. Engineering Electromagnetic – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd ed., 2005.
4. Networks, Lines and Fields – John D. Ryder, PHI, 2nd ed.,2003.
5. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.

Course Outcomes

After completing the course, students should be able to

1. Apply Maxwell's equations to solve equations of EM fields
2. Characterize uniform plane waves and wave propagation
3. Calculate reflection and transmission of waves at media interface
4. Explain the characteristics and wave propagation on high frequency transmission lines

5. Describe the principle of radiation and radiation characteristics of an antenna

PULSE & INTEGRATED CIRCUITS

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54020	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

UNIT I

LINEAR AND NONLINEAR WAVE SHAPING: Linear Wave Shaping: High pass & Low pass RC circuits and their responses for sinusoidal, step voltage, pulse, square wave, and ramp inputs. High pass RC circuit as Differentiator, Low pass RC circuit as an Integrator, Nonlinear Wave Shaping: Diode clippers, clipping at two independent levels, Clamping operation, Clamping circuits using diodes, Clamping circuit theorem, comparator circuit.

UNIT II

MULTIVIBRATORS: Multivibrators: Transistor as a switch, Transistor- switching times. Analysis and Design of Bistable, Monostable and Astable Multivibrator using Transistors, Schmitt trigger using transistors.

UNIT III

INTEGRATED CIRCUITS: Classification, Chip Size and Circuit Complexity, Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics. 741 Op-Amp and its Features, Modes of operation-inverting, non-inverting, differential. Applications- Basic Applications of Op-Amp, Sample & Hold Circuits, Differentiators and Integrators, Comparators, Schmitt Trigger.

UNIT IV

ACTIVE FILTERS, TIMERS & PHASE LOCKED LOOPS: Active Filters: First Order and Second Order Low Pass, High Pass filters, Band Pass, Band Reject and All Pass Filters. **555 Timers:** Functional Diagram, Monostable, Astable Operations and Applications, Schmitt Trigger. **Phase Locked Loop (PLL):** Block Schematic, Principles and Description of Individual Blocks of 565, VCO.

UNIT V

DATA CONVERTERS: Converters: D-A & A-D Converters- Introduction, Basic DAC Techniques - Weighted Resistor Type, R-2R Ladder Type, Inverted R-2R Type. Different types of ADCs - Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type, DAC/ADC Specifications.

TEXT BOOKS.

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, and Mothiki S. Prakash Rao, 2ed., 2008, TMH.

2. Linear Integrated Circuits -D. Roy Choudhury, New Age International (p)Ltd, 3" Ed., 2008.

3. Op-Amps and Linear Integrated Circuits - Concepts and Applications by James M. Fiore, Cengage/ Jaicc, 2/e, 2009.

REFERENCE BOOKS:

1. Pulse and Digital Circuits-A. Anand Kumar, PHI, 2005.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.
3. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
4. Digital Fundamentals - Floyd and Jain, Pearson Education, 8th Edition, 2005.

DIGITAL CIRCUITS

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54006	Core	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

Prerequisite: ANALOG DEVICES & CIRCUITS

Course Objectives

This course provides in-depth knowledge of digital logic and its Verilog representation. Which is the basis for design of any digital circuit. The main objectives are:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand basics of Boolean algebra and minimization using k-maps
3. To implement simple logical operations using combinational logic circuits.
4. To implement simple logical operations using sequential logic circuits.
5. To understand the concepts of sequential machines, enabling to analyze sequential systems in terms of state machines.

UNIT 1

NUMBER SYSTEMS AND CODES: Number systems, Conversions of number systems, signed, unsigned numbers and complements -1's, 2's, 9's and 10's. Binary arithmetic: addition, subtraction. Binary weighted and non-weighted codes, BCD addition and subtraction, Error detecting and error correcting codes.

INTRODUCTION TO VERILOG HDL: Verilog as HDL, Levels of Design Description, Simulation & Synthesis, Language Constructs.

UNIT II

BOOLEAN ALGEBRA: Logic gates, Postulates and theorems: representation of switching functions, SOP and POS, Karnaugh map representations, minimization using k-maps- upto 4 variables. Tabular method, realization of Boolean functions using universal gates.

UNIT III

COMBINATIONAL CIRCUITS: Introduction, Design procedure**,** Half-Adder, Full-Adder, Half- Subtractor, Full-Subtractor, Encoder, Decoder, multiplexer, de-multiplexer, code converters-binary to gray, gray to binary, BCD to excess-3 and excess-3 to BCD, Comparator, 4 bit adder/Subtractor, Introduction to PLD's, Logic implementation using PAL & PLA.

UNIT IV

SEQUENTIAL CIRCUITS: Introduction, Design procedure, memory elements: latch & flip-flops- SR, D, JK, T, race around condition-Master-Slave JK FF, Flip-Flop operating characteristics, flip-flop conversions, Design of synchronous sequential circuits: binary counters- up, down, up-down, MOD counters, other counters-Ring and Johnson, Shift registers- SISO, SIPO, PISO, PIPO, Universal shift register.

UNIT V

SEQUENTIAL MACHINES: Melay and Moore machines, state equivalence and machine minimization- partitioning approach.

INTRODUCTION TO DIGITAL IC's- Classification, two input standard TTL NAND&NOR- analysis, tri-state TTL.

TEXT BOOKS

1. Digital Logic Computer Design – By M. Morris Mano, PHI.1979
2. Digital Logic Design Principles – By Norman Balbamian and Breadly, John Wiley,2001.
3. S. Palnitkar, "Verilog HDL – A Guide to Digital Design and Synthesis", Pearson, 2003.
4. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCES

1. Introduction to Switching Theory and Logic Design- By F. J. Hill and Peterson, John Wiley Publications,1974.
2. Digital Logic – Applications & Design – By- John M. Yarbroough, Vikas Publications, 1997.

3. Digital Systems Principles, Applications– By Ronald J. Tocci, Pearson Education/Phil,2011.
4. Switching And Finite Automata Theory – By Zvi Kohavi, TMH Edition,3rd edition, 2009.
5. VerilogHDL Primer -By J.Bhasker BSpublications 2008.

Course Outcomes

After completing the course, students should be able to

1. Understand numeric information in different forms, e.g. different bases, signed integers, various codes such as Gray and BCD.
2. Understand Boolean algebra, minimization of Boolean functions.
3. Design combinational circuits by using building blocks.
4. Design sequential circuits by using sequential functions/building blocks.
5. Design and analyze the circuits using Finite state machines and minimization of state machines.

ELECTRONIC CIRCUIT ANALYSIS

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54021	Core	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Prerequisite: ELECTRONIC DEVICES AND CIRCUITS

Course objectives

1. To classify the single stage amplifiers and to understand the distortion in amplifiers and to analyse the amplifiers at Low Frequencies using Approximate Hybrid Model.
2. To learn the concepts of frequency response and analyse the BJT and MOS Amplifiers at Low and High Frequencies. To analyse the CE amplifier with SC current gain and resistive loads at High frequencies using Hybrid-Pi Model.
3. To classify and Analyse the multistage amplifiers.

4. To classify the Large signal amplifiers and determine the efficiency of each one.
5. To classify and analyse the Tuned amplifiers and Oscillators.

UNIT I

SINGLE STAGE AMPLIFIERS : Classification Of Amplifiers, Distortion In Amplifiers, Analysis Of CB, CE And CC Amplifiers Using Exact and Approximate Hybrid Model, Millers Theorem And Its Dual, Design Of CE Amplifier.

UNIT II

FREQUENCY RESPONSE OF BJT AND MOS AMPLIFIERS -: Frequency Response of BJT and MOS Amplifiers, Analysis At Low And High Frequencies. Hybrid Pi Model of BJT and MOS, CE Short Circuit Current Gain, Alpha, Beta Cut-Off Frequencies.

UNIT III

MULTI STAGE AMPLIFIERS: Different Coupling Schemes Used In Amplifiers- RC Coupled Amplifiers, Transformer Coupled Amplifiers And Direct Coupled Amplifiers. Analysis Of Cascaded RC Coupled BJT Amplifiers, Cascode Amplifiers, Darlington Pair, Effect of cascading on Gain and Bandwidth.

UNIT IV

LARGE SIGNAL AMPLIFIERS: Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifiers, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class B Push-Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Cross-Over Distortion, Heat Sinks.

UNIT V

TUNED AMPLIFIERS AND OSCILLATORS: Classification of Tuned Amplifiers, Quality Factor, Analysis of Single Tuned Amplifiers. OSCILLATORS: Conditions for oscillations, Principle of operation: RC Oscillators (RC Phase Shift Oscillator and Wein Bridge Oscillator), LC Oscillators (Hartley Oscillator and Colpitts Oscillator) and Crystal Oscillator.

TEXT BOOKS:

1. Fundamentals of Micro Electronics by Behzad Razavi, 2nd ed.,2013, Wiley.
2. Electronic devices and circuits - -S.Salivahana, N. Suresh kumar, A vallavaraj, 2nd ed.,2011.
3. Integrated electronic- Jacob Millman & Christor C Halkias, 2 ed.,2008, TMH.

REFERENCES

1. Introductory electronic devices and circuits- Robert T. Paynter, 7th ed.,2009, Pearson Education India.
2. Electronic circuit analysis- K.Lal Kishore , 2004, BSP Publication.
3. Electronic devices & circuit David A Bell-5th ed,.Oxford university press,1999.
4. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

Course outcomes

After completing the course, students should be able to

1. Design and analyse the single stage amplifiers at Low Frequencies using Approximate Hybrid Model.
2. Analyze the BJT Amplifiers at High Frequencies using Hybrid –Pi Model and determine α and β cutoff frequencies.
3. Describe the importance of Multi stage amplifiers and to analyze them to find frequency parameters.
4. Explain the application of Large signal amplifier and the usage of heat sinks.
5. Analyze the effect of cascading Single tuned and double tuned amplifiers on Bandwidth and understand the stability of the tuned amplifiers.

ELECTRONIC CIRCUIT ANALYSIS LAB

B. Tech II Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54211	Core	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

List of Experiments (12 Experiments to be done)

Course Objectives

1. To design and test the various amplifier circuits.
2. To understand the operation of the amplifier circuits by plotting the frequency response curve.
3. To operate and test the feedback amplifier circuits and interpret the results.
4. To generate the signals for the desired frequency using oscillator circuits.
5. To operate the large signal amplifiers and find the efficiency.

I. Design verification using Simulation tools (Any 6 Experiments)

1. Common Emitter Amplifier.
2. Common Base Amplifier.
3. Two Stage RC Coupled Amplifier.
4. Colpitts Oscillator.
5. Cascode Amplifier.
6. Wien Bridge Oscillator using Transistors.
7. RC Phase Shift Oscillator using Transistors.
8. Class A Power Amplifier (transformer less).
9. Class B Complementary Symmetry Amplifier.
10. Common Gate (JFET) Amplifier.

II. Testing in the Hardware Laboratory (6 Experiments)

A) Any Three circuits simulated in simulation laboratory

B) Any Three of the following

1. Class A Power Amplifier (with transformer load)
2. Class C Power Amplifier.

3. Single Tuned Voltage Amplifier.
4. Hartley Oscillators.
5. Darlington Pair.
6. Common Collector Amplifier.

Requirements

1. For software simulation of Electronic circuits.
   (i) Computer System with latest specifications.
   (ii) Connected in LAN (Optional)
   (iii) Operating system (Windows XP)
   (iv) Suitable Simulations Software.

2. For Hardware simulations of Electronic Circuits
   (i) Regulated Power Supply (0-30V)
   (ii) CRO's
   (iii) Function Generators
   (iv) Millimeters
   (v) Components.

Course outcomes

After completing the course, students should be able to

1. Design and test various amplifier circuits and to find the gain.
2. Calculate the lower and upper 3 dB frequencies and Bandwidth of the amplifier circuits.
3. Design and test the feedback amplifier circuits and interpret the results.
4. Design and test the oscillator circuits and interpret the results.
5. Design and test the large signal amplifier circuits and interpret the results.

PULSE & INTEGRATED CIRCUITS LAB

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54212	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

1. To design the various wave shaping circuits.
2. To demonstrate generation of various non-sinusoidal waveforms.
3. To analyze the operational amplifiers, timers and their applications in electrical and electronics circuits.
4. To acquire the knowledge on Digital IC families, its specifications and applications.
5. To distinguish linear and digital ICs for different applications

Minimum 12 experiments to be conducted:

List of Experiments

PART –I DESIGN VERIFICATION OF THE FOLLOWING CIRCUITS.

1. Linear wave shaping. (Using LabVIEW/Multisim software)
2. Non-Linear wave shaping- Clippers. (Using LabVIEW/Multisim software)
3. Non-Linear wave shaping –Clampers. (Using LabVIEW/Multisim software)
4. Transistor as a switch. (Using LabVIEW/Multisim software)
5. Astable Multivibrator.
6. Monostable Multivibrator.
7. Bistable Multivibrator.
8. Sampling gates

PART –II TO VERIFY THE FOLLOWING FUNCTIONS USING IC 741, IC 555, 74 SERIES TTL IC'S, CMOS IC'S

1. Adder, Subtractor, Comparator using IC 741 Op-Amp.
2. Integrator and Differentiator using IC 741 Op-Amp.

3. Active Low Pass & High Pass Butterworth (second order).
4. IC 555 timer in Monostable operation.
5. Schmitt trigger circuits using IC 741 & IC 555
6. 4 bit comparator 74LS85.
7. 8X1 Multiplexer- 74151 and 2X4 Demultiplexer-74155.
8. 3-8 decoder – 74LS138.
9. D Flip (74LS74) and JK Master-Slave Flip-Flop (74LS73).
10. Decade counter (74LS90) and UP –Down Counter (74LS192).
11. Universal Shift registers – 74LS194/195.

Equipment required for Laboratories

1. Regulated Power Supply - 0-30 V
2. CRO - 0-20 M Hz
3. Function Generators - 0- 1 M Hz
4. Components
5. Multimeters

Course Outcomes

1. After completing the course, students should be able to
2. Design linear and nonlinear wave shaping circuits.
3. Create various waveforms such as Square, Pulse and Sweep.
4. Design electronic switch.
5. Use of operational Amplifier (IC 741).
6. Design circuits using operational amplifiers for various applications.
7. Design various combinational circuits using various Digital Integrated IC’s.
8. Describe the differences between Linear and Digital Integrated IC’s.
    - ○

DIGITAL CIRCUITS SIMULATION LAB

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54213	Core	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives

1. To learn basic digital circuit equipment.
2. To design and verify basic gates.
3. To implement combinational logic circuits.
4. To implement sequential logic circuits.
5. To design and verify FSM

I. Design all the experiment and verify by using hardware Trainer kits/equipment (Any Six)

1. Introduction to Digital Laboratory equipment and tools
2. Design basic gates and verify their truth tables.
3. Design and implement a multiplexer.
4. Design and implement encoder and decoder
5. Design a Half adder, full adder & verify its truth table.
6. Design and construct basic flip-flops.
7. Design and construct of 4bit binary Counter.
8. Design and construct universal 4-bit shift register.
9. Finite State Machine design

II. Write a Verilog HDL for any 8 experiments and simulate the same using Cad tools.

1. Verilog HDL code to realize all the logic gates.
2. Verilog HDL code to realize 3 to 8 decoder and 8 to 3 encoder.
3. Verilog HDL code to realize 8 to 1 multiplexer and 1 to 8 demultiplexer. .
4. Verilog HDL code to realize a half adder, full adder.
5. Verilog HDL code to realize 4 bit comparator.
6. Verilog HDL code to realize basic flip-flops.
7. Verilog HDL code to realize a 4-bit binary Counter.
8. Verilog HDL code to realize a universal 4-bit shift register.

9. Design and Implementation of Digital Lock.

10. Design and Implementation of Traffic Light controller.

11. Design and Implementation of 4 Bit ALU.

12. Design and Implementation of Vending Machine.

Requirements

1. Hardware Trainer Kits
2. FPGA Trainer Kits
3. Computer System with latest specifications
4. Software HDL Verilog (Xilinx- Vivado)

Course Outcomes

After completing the course, students should be able to

1. Explain the basic digital circuit equipment.
2. Design and verify basic gates.
3. Implement combinational logic circuits.
4. Implement sequential logic circuits.
5. Design and verify FSM

GENDER SENSITIZATION

B. Tech II Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54022	Core	L	T	P	C	CIE	SEE	Total
		2	0	0				

Course Objectives

Course Objectives of Gender Sensitization are to:

1. Develop student's sensibility with regard to issues of gender in contemporary India
2. Provide a critical perspective on the socialization of men and women.

3. Introduce students to information about some key biological aspects of genders
4. Expose the students to debates on the politics and economics of work.
5. Help students reflect critically on gender violence.

Course Outcomes

1. At the end of the Gender Sensitization course, students will be able to:
2. Develop a better understanding of important issues related to gender in contemporary India.
3. Identify the basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
4. Analyze a finer grasp of how gender discrimination works in our society and how to counter it.
5. Acquire insight into the gendered division of labour and its relation to politics and economics.
6. Men and women students and professionals will be better equipped to work and live together as equals.

UNIT I

Understanding Gender: Gender: Why should we study it? (Towards a world of equals: Unit-1)

Socialization: Making Women, Making Men (Towards a world of equals: Unit-2)

Introduction, Preparing for womanhood. Growing up male. First lesson in caste. Different Masculinities. Just Relationships: Being Together as Equals (Towards a world of equals: Unit-12)

Mary Kom and Onler. Love and acid just do not mix. Love Letters. Mothers and Fathers. Further reading: Rosa Parks-The Brae Heart.

UNIT II

Gender And Biology: Missing Women: Sex Selection and its Consequences (Towards a world of equals: Unit-4)

Declining Sex Ration. Demographic Consequences.

Gender Spectrum: Beyond The Binary (Towards a world of equals: Unit-10)

Two or many? Struggles with Discrimination.

Additional Reading: Our Bodies, Our Health (Towards a world of equals: Unit-13)

UNIT III

Gender And Labour: Housework: The invisible Labour (Towards a world of equals: Unit-3)

“May Mother doesn’t work”. “Share the Load”. Women’s work: its politics and economics (Towards a world of equals: Unit-7)

Fact and Fiction. Unrecognized and unaccounted work. Further Reading: Wages and Conditions of Work.

UNIT IV

Issues Of Violence: Sexual Harassment: Say No! (Towards a world of equals: Unit-6)

Sexual Harassment, not Eve-teasing-coping with everyday Harassment-Further Reading: “Chupulu”. Domestic Violence: Speaking out (Towards a world of equals: Unit-8)

Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about sexual Violence (Towards a world of equals: Unit-11)

Blaming the Victim- “I Fought for my life…..” – Further reading: The Caste Face of Violence.

UNIT V

Gender Studies: Knowledge: Through the lens of gender (Towards a world of equals: Unit-5)

Point of View. Gender and the Structure of Knowledge. Further Reading: unacknowledged Women artists of Telangana.

Whose History? Questions for Historians and others (Towards a world of equals: Unit-9)

Reclaiming a past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

TEXT BOOKS

1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deep Sreenivas and Susie Tharu, " Towards a world of Equals; A Bilingual Textbook on Gender"
2. Sen, Amartya. "More than one million Women are Missing". New York review of books 37.20 (20 December 1990). Print. 'We Were Making History….' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women 1989.

REFERENCES

1. Tripti Lahari. "By the numbers: Where Indian Women Work. "Women's studies journal (14 November 2012) Available online at: http://blogs.wsj.com/indiarealtime/2012/11/14/by the numbers where Indian women work.

2. K. Satyanarayana & Susie Tharu (ed.) Steel are sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada

http://herpercollins.co.in/Bookdetail.asp? Book _code = 3732.

3. Monon, Nivedita, Seeing like a Feminist, New Delhi: Zubaan-Penguin Bokks, 2012.

4. Virginia Woolf: A Room of One's Own. Oxford: Black swan. 1992.

B.TECH III YEAR I SEMESTER 5T+ 3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	A55020	PC	Analog Communication Systems	3	0	0	3
2	A55021	PC	Microprocessors & Microcontrollers and Interfacing	2	1	0	3
3	A55022	PC	Linear Control Systems	2	1	0	3
4	A55023	PC	VLSI Design	3	0	0	3
5	A55080 A55093 A55041	OE	**Open Elective – I** 4. Entrepreneurship Development 5. Fundamentals of Engineering Materials 6. Mobile Application Development	3	0	0	3
6	A55206	PC	Analog Communication Systems Lab	0	0	2	1
7	A55207	PC	Microprocessors & Microcontrollers and Interfacing Lab	0	0	3	1.5
8	A55208	PC	VLSI Design Lab	0	0	2	1
9	A55091	MC	NSS/NSO	2	0	0	0
10	A55288	HS	LRQA	0	0	3	1.5
Total				**15**	**02**	**10**	**20**

III YEAR II SEMESTER 5T+3L

S.No	Course Code	Category	Course Title	L	T	P	Credits
1	A56026	HS	Project Management	3	0	0	3
2	A56027	PC	Digital Communication	2	1	0	3
3	A56028	PC	Digital Signal Processing	3	1	0	4
4	A56029	PC	Embedded Systems & IOT	3	0	0	3
5	A56030 A56031 A56032	PE	**Professional Elective-I** 4. CPLD &FPGA Architectures 5. Computer Organization and Operating System 6. Computer Networks	3	0	0	3

6	A56206	PC	Digital Signal Processing Lab	0	0	3	1.5

B. Tech III Year I Semester					Dept. of Electronics & communications		
Code	Category	Hours / Week			Credits	Marks	
A55020	PC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

7	A56207	PC	Embedded Systems & IOT Lab	0	0	3	1.5
8	A56230	HS	Skills Integrated English Lab	0	0	2	1
Total				**14**	**02**	**08**	**20**

ANALOG COMMUNICATION SYSTEMS

Prerequisite: Signals and Systems, Electronic Devices & Circuits

Course Objectives:

- To learn the basic concepts of amplitude modulation.
- To study DSB-SC and SSB-SC modulation generation and detection methods.
- To know about AM transmitters, receivers and know their performance.
- To study the concepts of angle modulation techniques and know their applications.
- To analyze the noise performance of Analog Modulation systems.

Unit-I: Amplitude Modulation:

Introduction to communication system, need for modulation, amplitude modulation-definition, time domain and frequency domain description, power relations in AM waves, Generation of AM waves:- square-law modulator, switching modulator. Detection of AM waves:-square law detector, envelope detector.

Unit-II: DSB-SC and SSB-SC Modulation:

DSB-SC Modulation: Definition, time domain and frequency domain description. Generation of DSBSC Waves- balanced modulator, ring modulator. Demodulation of DSB-SC waves- coherent detection, COSTAS Loop. SSB-SC modulation- Definition, time domain and frequency domain description. Generation of SSB-SC waves, frequency discrimination method and phase discrimination method. demodulation of SSB waves using synchronous detector.

Unit III: AM Transmitters and Receivers:

Introduction to vestigial side band modulation. AM transmitter block diagram and explanation of each block. AM receiver types- tuned radio frequency receiver, super heterodyne receiver. RF section and characteristics- Frequency changing and tracking, comparison of AM, DSB-SC, SSB-SC and VSB-SC Techniques. Applications of different AM systems.

Unit IV: Angle Modulation:

Basic concepts, frequency modulation: single tone frequency modulation, spectrum analysis of sinusoidal FM wave, narrow band FM, wide band FM, power and transmission bandwidth of FM wave. comparison of FM and AM.
Generation of FM waves: Direct method- parametric variation method (varactor diode, reactance modulator). Indirect method:- Armstrong method. Detection of FM waves- balanced frequency discriminator, phase locked loop.

Unit V: Noise and Pulse Modulation:

Noise in analog communication system, noise in DSB and SSB system, noise in AM System, pre-emphasis and de-emphasis. Types of Pulse modulation, PAM (Single polarity, double polarity) PWM- Generation and demodulation of PWM. PPM- Generation and demodulation of PPM.

Text Books:

1. H Taub & D. Schilling, Gautam Saha, “Principles of Communication Systems”, TMH, 3rd edition, 2007.
2. R.P. Singh, SP Sapre, “Communication Systems”, TMH, 2nd edition, 2007

Reference Books:

1. George Kennedy and Bernard Davis, “Electronics & Communication System”, TMH, 4th edition, 2009.
2. Simon Haykin, John Wiley, “Communication Systems”, Wiley, 4th edition, 2008.
3. KN Hari Bhat & Ganesh Rao, “Analog Communications”, Pearson Education India, 2nd edition, 2008.
4. B.P Lathi, “Communication Systems”, BS Publication, 2006.

Course Outcomes:

After completing this course, the student will be able to

- Understand the need for modulation and basic concepts of Amplitude modulation.
- Explain the advantages of DSB-SC and SSB-SC modulation techniques compared to AM.
- Apply and relate analog modulation techniques to real time applications like telecommunications, TV’s etc.
- Discuss the angle modulation technique FM its performance.
- Describe the noise performance of AM, DSB-SC, SSB-SC and FM Systems.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55021	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

MICROPROCESSORS & MICROCONTROLLERS AND INTERFACING

Prerequisite: Digital Circuits

Course Objectives:

- To understand the concepts of microprocessors, different addressing modes and programming of 8085.
- To understand the basic concepts of 8086.
- To Study the interrupt structure, communication standards and Serial communication and programming of 8086.
- To understand the basic concepts of 8051.
- To interface 8051 for realtime applications.

Unit-I: 8085 Microprocessor:

Evolution of microprocessors, the 8085 microprocessor, microprocessor communication and bus timings, generating control signals, 8085 MPU and its architecture and pin diagram, decoding and executing an instruction, instruction set and assembly language programming.

Unit–II: 8086 Microprocessor:

8086 architecture, register organization, memory segmentation, programming model, memory Addresses, physical memory organization, signal descriptions of 8086, timing diagrams. Addressing modes, assembler directives, macros, instruction set and assembly language programming of 8086: addressing modes, assembler directives, macros, simple programs involving logical, arithmetic expressions and string manipulations.

Unit–III: Interfacing to Microprocessors:

I/O interface with 8255-PPI, 8255-various modes of operation and interfacing to 8086, interrupt structure of 8086, serial communication standards, 8251 USART architectures and its interfacing to 8086, RS-232C. 8257 DMA controller and its interfacing to 8086, memory interfacing to 8086.

Unit-IV: 8051 Microcontroller:

Architecture, I/O ports, register set, memory organization, addressing modes and instruction set of 8051, interrupts in 8051, interrupt priority in the 8051.

Unit–V: Interfacing to Microcontroller:

Timers/Counters and serial communication registers in 8051, interface with keyboard & displays, serial data communication and timer/counter interfacing program.

Text Books:

1.Ramesh S Goankar, “Microprocessor Architecture Programming and Applications with the 8085”, Penram International Publishing 2013.
2. A.K. Ray & Bhurchandi, “Advanced Microprocessors and peripherals”, TMH publications, 2012.

Reference Books:

1. Kenneth Ayala and Dhanunjay Gadre, “The 8051 microcontroller”, Penram International/ Thomson, 2008.
2. Douglas V Hall, “Microprocessors and Interfacing: Programming and Hardware”, 2nd, TMH publications, 1992.
3. Kenneth J. Ayala, “8086 Micro Processor”, Penram International/ Thomson, 1995.

Course Outcomes:

After completing the course, students should be able to

- Write the assembly language programs of 8085 for simple applications.
- Write assembly language programs for different addressing modes of 8086.

  Apply the knowledge of interrupt structure of 8086, communication standards and serial communication in 8086 interfacing.
- Write the assembly language programs of 8051 for simple applications.
- Design 8051 interfacing with different peripherals.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55022	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

LINEAR CONTROL SYSTEMS

Prerequisite: Signals and systems, Mathematics

Course Objectives:

- To introduce basic concepts of control systems and transfer function representation
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and identify the needs of different
  types of controllers to ascertain the required dynamic response from the system
- To formulate different types of analysis in frequency domain to explain the nature of stability of the system.
- To design compensators and determine the stability of the system using state space analysis

Unit - I: Introduction to Control System:

Introduction: Concepts of control systems, open-loop and closed-loop systems. different examples of control systems. feedback characteristics, effects of feedback. Transfer function representation: block diagram algebra, determining the transfer functionfrom block diagrams, signal flow graphs(SFG) - reduction using mason's gain formula.

Unit - II: Time Response Analysis & PID Controllers:

Time response analysis- standard test signals. Time response of first and second order systems. Time domain specifications, steady state errors and error constants. PID controllers- effects of proportional derivative, proportional integral systems on steady state error.

Unit - III: Stability Analysis:

Concept of stability - Routh-Hurwitz Criteria. limitations of Routh's stability.
Root-Locus technique- construction of Root-loci, effects of adding poles and zeros to G(s)H(s) on the root loci.

Unit - IV: Frequency Response Analysis:

Introduction, frequency domain specifications, determination of frequency domain specifications from the bode diagrams, polar plots, concept of nyquist stability criterion.

Unit - V: Compensation Techniques & State Variable Analysis:

Compensation techniques – lag, lead, lead-lag compensators design in frequency domain. State Variable analysis - concepts of state variables, state space model, solution of state equations, state transition matrix (STM) and its properties, concept of controllability and observability.

Text Books:

1. B. C. Kuo, “Automatic Control Systems”, John wiley and son’s, 8th edition, 2003.
2. I.J.Nagrath and M.Gopal, “Control Systems Engineering”, New Age International (P) Limited, Publishers, 2nd edition, 2009.

References:

1. A. Nagoor kani, “Control Systems”, RBA Publications, June 2006.
2. Katsuhiko Ogata, “Modern Control Engineering”, Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
3. N.K.Sinha, “Control Systems”, New Age International (P) Limited Publishers, 3rd Edition, 1998.

Course Outcomes:

After completing the course, students will be able to

- Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions & effect of controllers on steady state response.
- Apply Routh-Hurwitz criterion and Root Locus to determine the stability of linear time-invariant systems in time domain.
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
- Identify the needs of different types of compensator to ascertain the required dynamic response from the system and analyse linear control system using the state space technique.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55023	PC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

VLSI DESIGN

Prerequisite: Electronic Devices & circuits, Digital Circuits

Course objectives:

- To give exposure to different steps involved in the fabrication of ICs using, transistors and passive components
- To explain electrical properties of transistors to analyse the behaviour of inverters designed with various loads.
- To give exposure to the design rules to be followed to draw the layout of any logic circuit.
- To provide concept to design different types of logic gates and analyse their transfer characteristics.
- To provide design concepts to design building blocks of data path of any system using gates.
- To understand basic programmable logic devices and testing of the circuits.

Unit-I: Introduction to IC Technology and Electrical Properties:

Metal-oxide-semiconductor (MOS), P-channel MOS, N-channel MOS, complementary MOS(CMOS) and Bi-CMOS technologies- oxidation, lithography, diffusion, ion implantation, metallization, encapsulation, probe testing, integrated resistors and capacitors, CMOS nanotechnology. Basic electrical properties : Basic electrical properties of MOS and Bi-CMOS circuits- Ids-Vds relationships, MOS transistor threshold voltage, gm, gds, figure of merit ωo, pass transistor, NMOS inverter, various pull ups, CMOS inverter analysis and design, Bi-CMOS inverters.

Unit-II: VLSI Circuit Design Processes:

VLSI design flow, MOS layers, stick diagrams, design rules and layout, 2μm CMOS design rules for wires, contacts and transistors layout diagrams for NMOS and CMOS inverters and logic gates, scaling of MOS circuits.

Unit- III: Gate Level Design Data Path Subsystems:

Complex gates, switch logic, alternate gate circuits, time delays, driving large capacitive loads, wiring capacitances, fan-in and fan-out, choice of layers. Data path

subsystems: Subsystem design, shifters, adders, ALUs, multipliers, parity generators, comparators, zero/one detectors, counters.

Unit- IV: Array Subsystems and Semiconductor Integrated Circuit Design:

SRAM, DRAM, ROM, serial access memory, content addressable memory
Semiconductor integrated circuit design: PLAs, FPGAs, CPLDs, standard cells, programmable array logic, design approach, parameters influencing low power design.

Unit- V: CMOS Testing:

CMOS testing, need for testing, test principles, design strategies for test, chip level test techniques, system-level test techniques, and layout design for improved testability.

Text Books:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI circuits and systems”, PHI, 2005 Edition.
2. Wayne Wolf, “Modern VLSI Design” Pearson Education, 3rd Edition, 2002.

References:

1. John P. Uyemura “CMOS logic circuit Design”, Springer, 2007.
2. Neil H.E Weste, David Harris, Ayan Banerjee. “CMOS VLSI Design – A circuits and systems perspective”, Pearson, 2009.
3. A. Albert Raj, Latha, “VLSI Design”, PHI, 2008.
4. Mead & Convey, “Introduction to VLSI”, BS Publications, 2010.
5. M. Micheal Vai, “VLSI Design”, CRC Press, 2009.

Course Outcomes:

After completing the course, students should be able to

- Utilize knowledge about the fabrication process of integrated circuit using MOS transistors.
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit.
- Design building blocks of data path using different types of logic gates.
- Design simple memories using MOS transistors and can understand design of large memories.
- Explain the different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55080	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Entrepreneurship Development

Course Objectives:

- To familiarize the student with entrepreneurship, the issues involved in it,
- The potential of entrepreneurship and intrapreneurship,
- The legal environment and statutory issues and explore various funding opportunities.

Unit – I: Introduction to Entrepreneurship:

- Entrepreneurship and intrapreneurship, business incubators, rural entrepreneurship, social entrepreneurship, women entrepreneurs, role of entrepreneurs in economic development, types of entrepreneurs. entrepreneurial mind set and stress, causes of failure.

Unit – II: Opportunity Identification:

- Myths and realities of entrepreneurship, opportunity identification, problem worth solving, idea generation techniques, design thinking.

Unit – III: Customer Analysis:

- Market segmentation, consumer persona, product market fit, unique value proposition.

Unit – IV: Business Model and MVP:

- Business model canvas, MVP, risks and assumptions, importance of financial planning.

Unit – V: Organizational Forms Funding Opportunities:

- Organizational forms - Partnership, sole proprietorship, corporation. intellectual property rights-

copyrights, trademarks, patents. law vs. ethics, informal capital- friends and family, angels, venture capitalists, idea/ patent, growth strategies.

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Textbooks:

1. Vasant Desai, YayatiNayak, “Entrerpreneurship”, Himalaya Publishing House,2018
2. Rajeev Roy, “Entrepreneurship”, Oxford University Press, 2/e, 2012

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References:

1. 1.D.F.Kuratko and T.V.Rao, “Entrepreneurship”, Cengage Learning,2012
2. 2.Dhruv Nath, Sushanto Mitra, “Funding Your Startup: And Other Nightmares”, 2020
3. V Srinivasa Rao, “Lean Digital Thinking: Digitalizing Businesses in a New World Order”, Bloomsbury India, 2021
4. S.K.Mohanty, “Fundamentals of Entrepreneurship”, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

Course Outcomes:

After completing the course, students should be able to

- Interpret the concepts of Entrepreneurship and Intrapreneurship.
- Apply the opportunity identification techniques
- Differentiate needs of different segments and their
- Develop business model and MVP
- Recognize organizational forms, IPR concerns and funding opportunities for startups.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55093	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Fundamentals of Engineering Materials

Course Objectives:

- Identify the relation between processing, structure and physical properties
- Understand the phase diagrams of binary systems
- Study the heat treatment principles
- Classify the different types of ferrous and non-ferrous metals
- Learn the recent developments in materials science and engineering

Unit-I: Crystal Structure:

Unit cells – metallic crystal structures – imperfections in solids: point, line, surface and volume defects – dislocation strengthening mechanisms – effect of grain size on the properties of metals and alloys

Unit-II: Alloys and Phase diagrams:

Necessity of alloying – effect of various alloying elements – substitutional and interstitial solid solutions – Hume Rothery's rules for solid solution – phase rule – lever rule. Phase diagrams: Interpretation of binary phase diagrams – isomorphous, eutectic, peritectic diagrams – iron iron-carbide phase diagram

Unit-III: Heat Treatment:

Annealing, normalizing, hardening, tempering, austempering, martempering – isothermal transformation curves – continuous cooling curves – surface hardening methods: case hardening, carburizing, nitriding, cyaniding, carbo-nitriding – age hardening

Unit-IV: Ferrous Metals, Non-Ferrous Metals and Alloys:

Ferrous metals: Classification, properties and applications of cast irons, plain carbon steels, stainless steel, tool steels, maraging steels, hadfield manganese steels, high speed steels. Non-ferrous metals and alloys: Properties and applications of copper and copper alloys: brass, bronze and cupro-nickel – aluminum and Al-Cu-Mg alloys – nickel based super alloys – titanium alloys

UNIT-V: Non-metals:

Classification, properties and applications of polymers, ceramics, composites and nano materials

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Text Books:

1. Sidney H. Avener,"Introduction to Physical Metallurgy",Tata Mc-Graw Hill Publications.
2. Donald R. Askeland,"Essential of Materials for Science and Engineering", CL Engineering Publications.
3. Kodgire,"Material Science and Metallurgy", Everest Publishing Home.
   -

References Books:

1. Agarwal,"Science of Engineering Materials",McGraw Hill Education.
2. William and collister,"Materials Science and Engineering", John Wiley and Sons.
3. V. Raghavan,"Elements of Material Science",Prentice Hall India Learning Pvt Ltd.
4. W. G. Vinas and H. L. Mancini,"An Introduction to Material Science", Princeton University Press.
5. R. A. Flinn and P. K. Trojan,"Engineering Materials and their Applications",Jaico books.

Course Outcomes:

At the end of this course, students will be able to:

- Discuss the crystal structure and defects
- Demonstrate the concept of alloying
- Construct the equilibrium diagrams of different alloys
- Select suitable heat treatment process to achieve desired properties of materials classify metals and non- metals

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55041	OE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Mobile Application Development

Course Objectives:

- Outline the usage of Android development framework.
- Understand the main components of an Android application and its entire life Cycle.
- Develop database programming using SQLite.
- Identify the use of location-based service in android applications.
- Build SMS and MMS applications using Intents.

Unit-I:Introduction to Android

Introduction to android, features of android, the development framework: understanding the android software stack, android application architecture; the dalvik virtual machine, creating first android application, types of android applications, android development tools: the android virtual device manager, android emulator, the dalvik debug monitor service.

Unit-II: Creating applications and Activities:

Introduction to the application manifest file, using the manifest editor, externalizing resources: creating resources - simple values, drawables, layouts, menus, animations. the android activity life cycle. building user interfaces: fundamental android ui design, introducing layouts: defining layouts, using layouts to create device independent user interfaces, optimizing layouts.

Unit-III: Databases and Content Providers:

Introduction to android databases, introducing sqlite, content values and cursors, working with sqlite databases - introducing the sqliteopenhelper, querying a

database, extracting values from a cursor, adding, updating, and removing rows, creating content providers, using content providers - introducing the content resolver, querying content providers, adding, deleting, and updating content

Unit-IV: Maps and Location based services:

Using the location-based services, selecting a location provider, selecting a location provider, finding current location; Creating map-based activities: Introducing map view and map activity, creating a map-based activity, maps and fragments

Unit-V: Telephony and SMS:

Using telephony - initiating phone calls, accessing telephony properties and phone state, monitoring changes in phone state using the phone state listener, introducing SMS and MMS -using SMS and MMS in your application, sending SMS and MMS from your application using intents, sending SMS messages using the SMS manager.

Text Book:

1. Reto Meier, “Professional Android 4 Application Development”, 1stEdition, Wrox Press, Wiley Publishing, 2014.

Reference Books:

2. Pradeep Kothari, “Android Application Development (with Kitkat Support)”, Black Book, 2014.
3. Erik Hellman, “Android Programming: Pushing the Limits”, 1st Edition, Wiley Publications, 2014.
4. Mike Wolfson, “Android Developer Tools Essentials”, O’Reilly Edition, 1st Edition, 2013.

Course Outcomes:

At the end of this course, students will be able to:

- Analyze the architecture of android and current trends in mobile operating systems.
- Apply suitable software tools and APIs for the design of user Interfaces to a particular mobile application.
- Design applications for mobile devices using SQLite database.
- Apply the location-based services in android applications.
- Summarize the monitoring changes to the phone, network, data connectivity and SIM states.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55206	PC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

ANALOG COMMNICATION SYSTEMS LAB

List of Experiments:

PART-A

All the experiments to be simulated using MATLAB or equivalent:

1. Amplitude Modulation & Demodulation
2. SSB-SC Modulation & Demodulation
3. Frequency Modulation & Demodulation
4. Frequency Synthesizer
5. Spectrum analysis of AM and FM Signals
6. Pulse Position Modulation & Demodulation

. PART-B

All the experiments to be verified in Hardware:

1. Amplitude Modulation & Demodulation
2. DSB-SC Modulation & Demodulation
3. Frequency Modulation & Demodulation
4. Frequency Synthesizer
5. Pulse Amplitude Modulation and Demodulation
6. Pulse Width Modulation & Demodulation

Equipments required for Laboratory:

i) CRO's - 0-20 M Hz
ii) Function Generators - 0- 1 M Hz
iii) Trainer kits

iv) TV Receiver Demo kit
v) Software: MATLAB or Equivalent

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55207	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

vi) Computers with latest Specifications.

Outcomes:

After completing the course, students should be able to

- Generate and detect analog modulated signals such as AM, DSB-SC, SSB-SC and FM and to analyze their performance.
- Study the functionality of Frequency Synthesizer and its applications.
- Generate and detect analog modulated signals such as PAM, PPM and PWM and to analyze their performance.
- Observe the spectral Characteristics of AM and FM signals.

MICROPROCESSORS & MICROCONTROLLERS AND INTERFACING LAB

Course objectives:

- To understand the fundamentals of assembly level programming of microprocessors.
- To understand the concepts of assembly language programming and its applications.
- To learn to develop the assembly level programming using 8086 instruction set.
- To learn to develop the assembly level programming using 8051 instruction set.
- To learn to interface peripherals with 8086 and 8051.

Note: Minimum of 12 experiments to be conducted.

List of Experiments:

The Following programs/experiments are to be written for assembler and execute the same with 8086 Microprocessor and 8051 microcontroller.

1. Programs for 16 bits arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array and to generate Fibonacci series for 8086.
3. Programs for string manipulations for 8086.
4. Program for digital clock design using 8086.
5. Interfacing ADC and DAC to 8086.

6. Parallel communication between two microprocessors using 8255.

7. Interfacing to 8086 and programming to control stepper motor using.

8. To interface Seven Segment Display using 8086

9. Programming using arithmetic, logic and bit manipulation instructions of 8051.

10. Program and verify Timer / Counter in 8051.

11. Program and verify Interrupt handling in 8051.

12. UART Operation in 8051.

13. LCD interface with 8051.

14. Keypad Interface with 8051.

Course outcomes:

After completing the course, students should be able to

- Build a program on a microprocessor using instruction set of 8086.
- Analyze the problems and apply a combination of hardware and software to address the problem
- Contrast how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
- Experiment with standard microprocessor interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters
- Design 8051 microcontroller interface with I/O peripherals.

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55208	PC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

VLSI DESIGN LAB

Course Objectives

- To design combinational circuits using HDL
- To design sequential circuits using HDL
- To design and analyse combinational circuits using Cadence/mentor graphics
- To design and analyse sequential circuits using Cadence/mentor graphics

List of Experiments:

Note: All experiments from each cycle are to be conducted.

E-CAD programs:

Programming can be done using any complier. Down load the programs on FPGA/CPLD boards and performance testing may be done by simulation using XILINX or equivalent front end tools.

Cycle -1

1. HDL code to realize all the logic gates
2. Design of full adder using 3 modelling styles
3. Design of flip flops: SR, D.
4. Design of 4 bit binary counter

Cycle -2

VLSI Experiments:

Experiments can be done using CADENCE or Equivalent CAD tools

Draw the schematic, Layout and perform physical verification, of the following.

1. CMOS inverter
2. CMOS NAND NOR, gates

3. CMOS AND, OR, gates
4. CMOS XOR and MUX gates
5. CMOS 1-bit Full Adder
6. CMOS SR and D Flip Flops
7. Pass Transistor
8. Design of 4 bit binary counter

Requirements:

1. PC: P-IV
2. Operating system: Windows XP or Higher version
3. Software: XILINX, Cadence/Mentor Graphics
4. Kits: FPGA Spartan 3 & ZED Boards.

Course Outcomes:

After completing the course, students should be able to

- Realize all logic gates
- Design combinational circuits
- Design Sequential circuits
- Understand Combinational Circuits Design using Cadence tool
- Analyse combinational, sequential circuits using CAD Tool.

B.Tech-ECE III-Year-I-Semester **L/ T/ P C**

2 / 0 / 0 0

A55091 NSS / NSO

B. Tech III Year I Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A55288	HS	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

LRQA

Course Objectives

Unit- I:

Number System : Speed Math's , Numbers , Factors ,Prime and co primes , LCM & HCF , Divisibility rules , Finding the unit digit and applications , remainder theory. Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages. Percentages: Introduction to percentages, percentage increase /decrease, results on population, results on depreciation, variations, applications of percentage Profit and Loss: Classification of profit and loss, profit/ loss percentages, successive discount.

Unit-II:

Time and Distance: Difference between the average, relative and effective speed , reaching the destination late and early , stoppage time per hour, problems based on trains and problems based on boats. Time and Work: Calculating efficiency, alternate days concept, work and wages ,chain rule , problems based on pipes and cisterns. Simple and Compound Interest : Simple interest ,principle , rate, amount , applications of simple interest , compound interest , compounded annually , compounded half yearly , compounded quarterly , difference between simple and compound interest .

Unit-III:

Permutations and Combinations: Fundamental rules, problems on permutations and combinations. Probability: Definition, notations and problems based on probability. Mean, Median and Mode : Introduction and problems on mean, median and mode. Partnership: Relation between partners, period of investments and shares. Averages: Average of different groups, change in average by adding, deleting and replacement of objects. Flow Chart : Introduction of symbols and problems on flow charts.

Unit-IV:

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement. Puzzles : Paragraph, incomplete puzzles and problems on them. Number Series: Number, Alphabet and Letter Series. Analogy: Simple, Double, Word and Number Analogy. Coding and Decoding: Classifications and Problems on Coding and Decoding.

Unit-V:

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time. Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years. Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows. Blood Relations: Defining the various relations among the members of a family, Solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books :

1. R.S Agarwal,*"Verbal and Non Verbal Reasoning",* New Edition -2020, S. Chand.
2. R.S Agarwal,*"Quantitative Aptitude",* New Edition- 2020, S. Chand.

References:

1. Abhijeet Guha,*"Quantitative Aptitude",* New Edition-2020, Mc Graw Hill.

Course Outcomes:

After completing the course, students should be able to

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56026	HS	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

PROJECT MANAGEMENT

Course objectives:

- understand the concepts of project management,
- explain how to identify the projects and planning,
- analyze how to execute the projects,
- assess how to lead the team and evaluation of projects
- to explain the Performance Measurement and Evaluation of the projects.

UNIT-I: Introduction

Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

UNIT-II: Project Identification and Planning

Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure, financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT-III: Project Execution

Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT-IV: Leading Project Teams

Building a project team, characteristics of an effective project team. Achieving cross-functional co-operation, virtual project teams, conflict management, negotiations.

UNIT-V: Performance Measurement and Evaluation

Monitoring project performances, Project control cycles, Earned Value management, Human factors in project evaluation and control. Project termination, types of project terminations, project follow-up. Current and future trends in project management.

Text book:

1. Jeffery K. Pinto, “Project Management”, Pearson Education,2015
2.Gray, Larson, “Project Management”, Tata McGraw Hill,2015.

References Books:

1. Enzo Frigenti, “Project Management”, Kogan, 2015.
2. R. Panneerselvam & P. Senthilkumar, “Project Management”, PHI, 2015.
3. Thomas M.Cappels, “Financially Focused Project Management”, SPD,2008.
4. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

Course outcomes:

After completing the course, students should be able to

- Explain the phases of project life cycle.
- Identify the projects and planning the projects
- Evaluate to control the project execution.
- Analyze how to lead the project team
- Discuss the recent trends in project management.

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56027	PC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	50	50	100

DIGITAL COMMUNICATION

Prerequisite: Signals & Systems, Analog Communication Systems and Digital Circuits

Course Objectives:

- To understand the model of digital communication system and its individual blocks.
- To study various digital modulation techniques and their performance in terms of Probability of error.
- To describe the concept of entropy and need for source coding technique.
- To analyze the necessity of error control coding in digital communication systems.
- To discuss the concept of spread spectrum technique and its applications in CDMA.

UNIT –I: Digital Communication System and Baseband Transmission:

Model of digital communication system, advantages of digital communication system, digital representation of analog signal. baseband transmission-pulse code modulation (PCM), PCM generation and reconstruction, quantization noise, Non uniform quantization and companding, differential pulse code modulation(DPCM), delta modulation (DM) and it's draw backs, adaptive delta modulation (ADM), noise in PCM and DM.

UNIT- II: Digital Modulation Techniques:

Amplitude shift keying (ASK), ASK modulator, ASK detector, binary frequency shift keying (BFSK), bandwidth and frequency spectrum of BFSK, non coherent BFSK detector, binary phase shift keying (BPSK), coherent BPSK detector, quadrature phase shift keying (QPSK), signal space representation, probability of error of ASK, BFSK and BPSK.

UNIT-III: Information Theory:

Information and entropy, conditional entropy and redundancy, mutual information, source coding techniques-Shannon-Fano coding, Huffman coding, Source coding to increase average information per bit. Bandwidth- S/N tradeoff, Hartley-Shannon law.

UNIT-IV: Error Control Coding:

Matrix description of linear block codes, Error detection and correction capabilities of linear block codes. Cyclic codes - Algebraic structure and encoding, Syndrome calculation and decoding. Convolutional codes - Encoding using state, Tree and trellis diagrams, Decoding using veterbi algorithm.

UNIT-V: Spread Spectrum Modulation:

Use of spread spectrum, direct sequence spread spectrum (DSSS), spread spectrum and code division multiple access, ranging using DSSS, frequency hopping spread spectrum, PN sequence generation and characteristics.

Text Books:

1. Herbert Taub. Donald L Schiling, Goutam Saha, *"Principles of communication systems"*, McGraw-Hill,Third Edition, 2008.
2. Simon Haykin, "*Digital Communication*", John Wiley, 2008.

Reference Books:

1. John G. Proakis,Masoudsalehi, "*Digital Communications*",McGraw-Hill,Fifth Edition, 2008.
2. Ian A. Glover, Peter M. Grant, "*Digital Communications*", Pearson Education, Third Edition 2008.
3. R.P Singh, S D Sapre ,"*Communication Systems*", McGraw-Hill,Second Edition,2007.

Course Outcomes:

After completing this course, the student will be able to

- Understand the advantages of digital communication system.
- Analyze the performance of various digital modulation techniques such as ASK, FSK and PSK in terms of their probability of error.
- Apply source coding technique to increase average information per bit
- Study block codes, cyclic codes and convolutional codes.
- Get familiarized with spread spectrum systems.

DIGITAL SIGNAL PROCESSING

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A56028	PC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	50	50	100

Prerequisite: Mathematics -I, Signals and Systems.

Course Objectives:

- To understand the fast computation of DFT and appreciate the FFT processing
- To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specification.
- To learn the design procedures used for filter bank and FIR filter
- To learn to program a DSP processor to filter signals

Unit –I: Discrete Fourier Transform

Review of Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) – deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

Unit-II: INFINITE IMPULSE RESPONSE FILTERS

Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design digital IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

Unit-III: FINITE IMPULSE RESPONSE FILTERS

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

Unit-IV: FINITE WORD LENGTH EFFECTS

Review of fixed point and floating-point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error – product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow. Special features and Architecture of Programmable DSP Processors (TMS320C5X).

Unit–V: MULTIRATE DSP APPLICATIONS

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor. Filter Design and Implementation of sampling rate conversion, Multistage Implementation, Implementation of Digital Filter Bank.

Text Books:

1. John G. Proakis, Dimitris G.Manolakis, "Digital Signal Processing- principles, Algorithms, and Applications",fourth edition, Pearson Education, 2007.
2. A. V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing" ,PHI,second edition, 2009.
3., B. Venkataramani,M. Bhaskar, "Digital Signal Processing-Architecture, Programming and Applications" ,TATA McGraw Hill, 2002.

References Books:

1. Emmanuel C. Ifeachor and Barrie W. Jervis,"*Digital Signal Processing - A Practical approach*",second Edition, Pearson Education, 2009.
2. Andreas Antoniou," *Digital Signal Processing*",TATA McGraw Hill, Edition 2006.
3. MH Hayes, schaum's Outlines, "*Digital Signal Processing*",TATAMc-Graw Hill,2007.
4. Robert J. Schilling, Sandra L. Harris, "*Fundamentals of Digital Signal Processing using MATLAB*" , Thomson, 2007.
5. Alan V.Oppenheim, RonaldW. Schafer," *Digital Signal Processing*",PHI Edition.,2006

Course Outcomes:

After completing the course, the student will able to

- Understand the spectra of signals that are to be processed by a discrete time filter, and to compute the DFT by various algorithms.
- Analyze and implement a digital filter structure
- Design and realize IIR by Butter worth and Chebyshev methods
- Design and realize FIR by windowing methods
- Apply signal processing algorithms in DSP processor

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A56029	PC	L	T	P	C	CIE	SEE	Total

		3	0	0	4	50	50	100

Prerequisite: Microprocessors & Microcontrollers and Interfacing

Course Objectives:

- To understand the prerequisite of embedded system,
- To differentiate embedded systems with general purpose systems.
- To analyze module requirement of embedded systems
- To evaluate the embedded systems applications to IOT
- To design the IoT applications for industry applications.

Unit-I: Introduction to Embedded Systems:

Definition of embedded system, embedded systems vs general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems
Typical Embedded System: Core of the embedded System: General purpose and domain specific processors, ASICs, PLDs, commercial off-the-shelf components (COTS).

Unit-II: Memories for embedded systems:

ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, sensors and actuators, communication interface: On board-I2C and SPI, external communication interfaces-RS232, ethernet, USB, bluetooth,Wifi.

Unit-III: RTOS Based Embedded System Design:

Operating system basics, types of embedded operating systems, tasks, task scheduling algorithms : Preemptive, non-preemptive, round robin, weighted round robin. Kernel objects, semaphores, mutex, pipes and message queues.

Unit-IV: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT Levels and deployment templates. Introduction to M2M, difference between IoT and M2M.

Unit-V: Domain Specific IoTs :

Home automation, cities, environment, energy, retail, logistics, agriculture , industry ,health and lifestyle.

Text Books:

1. Shibu K.V, *"Introduction to Embedded Systems",* McGraw Hill, edition 2,2016.
2. Raj Kamal, "Embedded Systems", TMH,2nd edition, 2008.
3. Vijay Madisetti, Arshdeep Bahga, —*Internet of Things (A Hands-on Approach*), Universities Press, 2015.

References Books:

1. Frank Vahid, Tony Givargis, "*Embedded System Design*", John Wiley, 3rd Edition, 2006.
2. Dr. K. V. K. K. Prasad; "*Embedded / real –time systems: concepts, design & programming*," Black Book; Dream tech press, Reprint edition 2013.
3. David E. Simon, "*An Embedded Software Primer*", Pearson Education, Reprint 2005.

Course Outcomes:

After completing the course, students should be able to

- Explain the basics of Embedded Systems.
- Apply basic concepts in designing Embedded Systems.
- Describe Different Embedded Systems Development tools in designing Embedded Systems.
- Utilize the techniques used in debugging embedded software.
- Design the applications of embedded systems

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A56030	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

CPLD AND FPGA ARCHITECTURES

Prerequisite: Digital Circuits, VLSI Design

Course Objectives:

- To understand the types of programmable logic devices and the differences between these devices.
- To gain knowledge of various FPGA architectures and their applications.
- To analyse and compare different architectures of FPGAs based on their performance
- To analyse and compare different architectures of CPLDs based on their performance
- To perform Case studies on advanced FPGA/CPLD architectures

Unit-I: Introduction to Programmable Logic Devices:

Introduction, simple programmable logic devices, read only memories, programmable logic arrays, programmable array logic architectures, applications implementation of MSI circuits using PLDs.

Unit –II: Field Programmable Gate Arrays:

Organization of FPGAs, FPGA programming technologies, programmable logic block architectures, programmable interconnects , programmable I/O blocks in FPGAs, dedicated specialized components of FPGAs, applications of FPGA.

Unit-III: FPGA Architectures:

Introduction, SRAM programmable FPGAs, anti-fuse programmable FPGAs, XC4000 architectures, Altera's FLEX 8000/10000 FPGAs and their performances. Case study: XC7Z020; XC7A200.

Unit –IV: CPLD Architectures:

Complex programmable logic devices; Altera MAX 7000, Actel ACT1, ACT2 and ACT3 Architectures and their performances, AMD's-CPLD (Mach 1 to Mach 5).

Unit-V: Design Applications:

Design considerations using CPLDs & FPGAs of parallel adder cell, Parallel adder sequential circuits, counters, multiplexers, parallel counters. Case study: design considerations of zynq7000 series and Artix7 series

Text Books:

1. S. Brown, R.Francis, J.Rose, Z.Vransic, "*Field Programmable Gate Array*", Kluwer Publications, 1992.
2. P.K. Chan & S. Mourad, "*Digital Design Using Field Programmable Gate Array*", prentice Hall(Pte), 1994.

Reference Books:

1. J. Old Field, R.Dorf, "*Field Programmable Gate Arrays*", John Wiley & Sons, New York, 1995.
2. S.Trimberger, Edr. "*Field Programmable Gate Array Technology*", Kluwer Academic Publications, 1994.

Course Outcomes:

After completing the course, student will be able to

- Acquire Knowledge about various architectures and device technologies of PLDs
- Comprehend FPGA Architectures.
- Describe different FPGA architectures and analyse their performances.
- Describe different CPLD architectures and analyse their performances.
- Analyze System level Design on advanced FPGA/CPLD architectures

Code	Category	Hours / Week			Credits	Marks		
A56031	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Prerequisite: Microprocessors & Microcontrollers and Interfacing

Course Objectives:

- To get familiarized with the concepts of memory connection to CPU.
- To understand the connectivity and communication between processors.
- To implement scheduling algorithms in operating system.
- To study single set of code that can be used by several processors at different stages of execution.
- To demonstrate the knowledge of task synchronization deadlock issues and allocating memory in OS.

Unit -I: Basic Structure of Computers and Memory Hierarchy:

Basic Structure of Computers-Computer Types, Functional Unit, Memory Hierarchy-Main memory, memory address map, memory connection to CPU, Auxiliary memory- Magnetic disks, magnetic tapes, Cache memory- hit and miss ratio, direct, associative and set associative mapping.

Unit-II: Multiprocessors:

Characteristic of multiprocessor, Interconnection structure- time shared common bus, multiport memory, cross bar switch, multistage switching network, Interprocessor communication and synchronization-mutual exclusion with a semaphore.

UNIT-III: Operating Systems Overview and Process Management:

Introduction-What operating system do, operating system structure (uni-programmed and multi programmed), operating system operations, operating system services, System calls, types of system calls, process scheduling – basic concepts, scheduling criteria, scheduling algorithms, thread scheduling.

Unit-IV: Multithreading and Synchronization:

Multithreaded programming-Overview, multithreading models, process coordination synchronization-background, the critical section problem, Peterson's solution, synchronization hardware, semaphore, classical problems of synchronization, monitors.

Unit-V: Deadlocks & Memory Management:

Principles of deadlock-system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, detection and avoidance, recovery from deadlock. Memory management- swapping, contiguous memory allocation, paging, segmentation.

Text Books:

1. M.Morris Mano, "*Computer Systems and Architecture*" , Third Edition, Pearson /PHI,2011.
2. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "*Operating System Concepts*", 9th edition , John Wiley, 2016.

References Books:

1. **C.** Hamacher, Z. Vranesic and S. Zaky, "*Computer Organization*", McGraw-Hill, 2002.
2. W. Stallings, "*Computer Organization and Architecture - Designing for Performance*", Prentice Hall of India, 2002.
3. J .P. Hayes, "*Computer Architecture and Organization*", McGraw-Hill, 1998.
4. D.M. Dharmdhere, "*Operating Systems – A Concept based Approach*", 2nd Edition. TMH, 2007.
5. Andrew S Tanenbaum, "*Modern Operating Systems*", 3rd Edition, PHI, 2008.

Course Outcomes:

After completing this course, the student will be able to

- Improve usage of memory hierarchy in CPU.
- Select suitable interconnection structure and communication in multiprocessors.
- Evaluate suitable scheduling algorithms in operating system applications.
- Analyze task Synchronization and multithreading in operating systems.
- Examine Memory management techniques and dead lock avoidance

COMPUTER NETWORKS

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56032	PE	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Prerequisite: Digital Circuits, Digital communication

Course Objectives:

- To get familiarized with a general overview of the concepts, fundamentals of computer networks, and error-free transmission.
- To become aware of protocols related to data link layer and channel access and utilization methods.
- To get familiarized themselves with the process of routing protocols and strategies.
- To learn to know different techniques for reliable transmission and quality services in computer networks.
- To get familiarized to use different protocols for the exchange of data from the server.

Unit-I: Network Models:

Network Models: Layered tasks, OSI model, layers in the OSI model, TCP/IP protocol Suite, Addressing. Data Link Layer: Error detection and correction-check sum, crc; data link control-framing, flow, and error control.

Unit-II: Data Link Layer:

Data link layer protocols, noiseless channels, noisy channels, HDLC; Multiple Access - random access, controlled access, channelization.

Unit -III: Network Layer:

Network Layer: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6; Delivery, forwarding, routing- static routing, dynamic routing, unicast routing protocols.

Unit-IV: Transport Layer:

Transport Layer: TCP, UDP, SCTP; congestion control and quality of service - data traffic, congestion control. Quality of service, techniques to improve QoS.

Unit-V: Application Layer:

Application Layer: Domain name system: name space, domain name space, DNS in the Internet, DNS Messages, Electronic Mail, FTP, HTTP.

Text Books:

1. Behrouz A Forouzan, "*Data Communications and Networking*", 4th edition, McGraw-Hill Special Indian Edition 2006.
2. Andrew S Tanenbaum, David. j. Wetherall, "*Computer Networks*" 5th edition. Pearson Education/PHI 2011.

References:

1. S. Keshav, "*An Engineering Approach to Computer Networks*", 2nd edition, Pearson Education, 1997.
2. William Stallings, "*Data Communications*", 8th edition, Pearson Publishers.

Course Outcomes:

After completing the course, students should be able to

- Gain the knowledge of the basic computer network technology, functions of each layer in the OSI and TCP/IP reference model.
- Gain the knowledge of multiple access protocols for different networks
- Obtain the skills of subnetting and routing mechanisms.
- Obtain the skills to improve quality data transmissions.
- Familiarity with the essential protocols which function as an interface between the user and communicating devices.

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	Category	Hours / Week			Credits	Marks		
A56206	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

DIGITAL SIGNAL PROCESSING LAB

Course Objectives:

- To verify properties of a discrete system
- To analyse discrete time signals using various transforms
- To design and implement different types of digital filters
- To verify basic properties of multi rate systems

List of Experiments

1. Compute the N-point DFT and IDFT of a given sequence and analyze the power density spectrum of the sequence.
2. Compute N-point DIT-FFT of a given sequence and verify the results with the DFT. Analyze the computational complexity of the DIT-FFT and compare it with that of the DFT.
3. Compute N-point DIF-FFT of a given sequence and verify the results with the DFT. Analyze the computational complexity of the DIF-FFT and compare it with that of the DIT-FFT
4. Design an Analog Infinite Impulse Response (IIR) Butterworth Filter and analyze its performance characteristics.
5. Design an Analog IIR Chebyshev filter and analyze its performance characteristics
6. Design a Digital IIR Filter using the Bilinear Transformation method and analyze its performance in both the time and frequency domains.
7. Design a Digital IIR Filter using the Impulse Invariance method and analyze its performance in both the time and frequency domains.
8. Design a Digital Finite Impulse Response (FIR) filters (Low Pass/High Pass) using various windowing techniques:
   a. Boxcar (Rectangular) Window
   b. Blackman Window
   c. Kaiser Window
   d. Bartlett Window

   Analyze the performance of each window function in shaping the FIR filter's frequency response and compare their characteristics
9. Analyze the effect of quantization on the accuracy of Analog-to-Digital Conversion (ADC) and Calculate the Signal-to-Quantization-Noise Ratio (SQNR) for each bit depth.

10. Analyse the effects of using fixed-point representation compared to floating-point and Calculates and displays the quantization error for each word length.
11. Explain the processes of decimation, interpolation and sampling rate conversion in digital signal processing in time domain.
12. Design a multistage digital filter bank for decomposing a given input signal into sub-bands.
13. Implement FIR Filter for Low pass, High pass, and Band pass filtering on TMS320C6713 DSK DSP Processor
14. Implement Butter worth and Chebyshev IIR Filters for Low pass, High Pass, and Band pass filtering on TMS320C6713 DSK DSP Processor

Course Outcomes:

The student, after successful completion of the course, will be able to

1.Compute DFT and IDFT of a given sequence.

2.Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.

3.Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.

4.To implement decimation & interpolation processes

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56207	PC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

EMBEDDED SYSTEMS & IOT LAB

Course Objectives:

On completion of this lab course the students will be able to:

1. Learn to design and implement various embedded system.
2. Learn to code python.
3. Learn to implement communication protocol.
4. Learn to implement MQ Telemetry Transport protocol.

List of Experiments

1. Familiarization with Arduino/Raspberry PI and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.

8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when `1T0' is received from smartphone using Bluetooth.

B. Tech III Year II Semester					Dept. of Electronics & communications			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56230	HS	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
12. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data

Course Outcomes:

- Understand the Embedded system applications
- Integrate Embedded modules specific application
- Implement an architectural design for IoT for specified requirement
- Solve the given societal challenge using IoT
- Choose between available technologies and devices for stated IoT challenge

SKILLS INTEGRATED ENGLISH LAB

Course Objectives

1. To improve the students' fluency in English, through a well-developed vocabulary
2. To enable them to respond them appropriate socio-cultural and professional contexts.
3. They will be able to communicate their ideas relevantly and coherently in writing.

Exercise I

Presentation Skills: Oral presentations (individual and group) / JAM sessions/Seminar - Power point presentations - Body Language-kinesics - Haptics

Exercise II

Group Discussion: Dynamics of Group Discussion - Dos and Don'ts – Intervention - Summarizing - Modulation of Voice - Relevance - Fluency and Coherence

Exercise III

Vocabulary Building: synonyms and antonyms - Word Roots - One-Word Substitutes, - Prefixes and Suffixes - study of Word Origin- -Analogy -Idioms and Phrases

Exercise IV

Writing Skills: Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose - Report Writing - Business Report Writing - Research Abilities/Data Collection/Organizing Data/Tools/Analysis

Exercise V

Interview Skills: Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interview through Telephone and Videoconferencing.

A mini project should be given for the students to work in teams and the Assessment is done.

Minimum Requirements:

The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a digital stereo –audio & video system.

System Requirement (Hardware component): *Computer network with Lan with minimum 60* multimedia systems with the following specifications:

i) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

References Books:

1. Dr. Rao, A. Ramakrishna., Dr. G. Natanam and Prof SA Sankaranarayana. *English Language Communication: A Reader cum Lab Manual. Chennai*: Anuradha Publications, 2008.
2. *English Vocabulary in Use series*. Cambridge University Press, 2008.
3. Nicholls, Anne. *Master Public Speaking.* JAICO Publishing House, 2006.
4. Sen, Leena. *Communication Skills.* New Delhi: PHI Learning Pvt Ltd, 2009.

Course Outcomes

The students will be able to

- make oral presentations effectively
- participate in group discussions
- develop vocabulary
- write project/Business reports
- take part in social and professional communication

IV YEAR I SEMESTER **6T+2L**

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	A57040	PC	Microwave & Radar Engineering	3	0	0	3
2	A57041	PC	Cellular & Mobile Communication	2	1	0	3
3	A57042	PE	**Professional Elective –II** 4. Digital Image Processing	3	0	0	3
	A57043		**5.** Software Defined Radio				
	A57044		6. Low power VLSI				
4	A57045	PE	**Professional Elective –III** 4. Machine Learning & Artificial Neural Networks	3	0	0	3
	A57046		5. Analog VLSI Design				
	A57047		6. Advanced Communications & Networks				
5	A57048	PE	**Professional Elective –IV** 4. Antenna Theory & Design	3	0	0	3
	A57049		5. Optical Communication				
	A57050		6. Bio-Medical Signal Processing and Telemedicine				
6	A57051	PE	**Professional Elective-V** 4. Adaptive Signal Processing	3	0	0	3
	A57052		5. Organic and Flexible Electronics				
	A57053		6. Satellite Communication				
7	A57207	PC	Microwave & Digital Communication Lab	0	0	2	1
8	A57208	PC	Cellular & Mobile Communication Lab	0	0	2	1
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2

Total	**17**	**01**	**08**	**22**

IV YEAR II SEMESTER

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	A58002 A58016 A58014	OE	**Open Elective –II** 4. Intellectual Property Rights 5. Python Programming 6. Disaster Preparedness and Planning	2	1	0	3
2	A58017 A58001 A58018	OE	**Open Elective –III** 4. Introduction to Deep Learning 5. Technical and Business Communication Skills 6. Green Technologies	2	1	0	3
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva -Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
6	A58501	IE	Industry Elective (MOOCS)	0	0	6	3
Total				**4**	**2**	**24**	**20**

IV - Year B.Tech – ECE – I - Semester

L/T/P C

3/0/0 3

A57040 Microwave and Radar Engineering

Prerequisite: Electromagnetic Theory and Transmission Lines.

Course Objectives:

- To develop knowledge on waveguides, waveguide components and their applications radar fundamentals and analysis of the radar signals
- To understand and analyze the operation of microwave tubes like klystron, magnetron TWT etc. and different radars like CW radar, pulse radar, MTI radar etc.
- To analyze the operation of microwave solid state devices and radar systems like tracking radars
- To understand the concepts of microwave junctions, scattering parameters and detection of radar signals in presence of noise
- To analyze microwave test bench for measuring different parameters like attenuation, power, VSWR etc. and the radar receivers

Unit-I: Rectangular waveguides and waveguide components:

Introduction to microwaves - characteristic features, advantages and applications. Waveguide basic concepts, TE and TM mode equations in rectangular waveguides. Microwave power flow and power losses, illustrative problems.

Waveguide components and applications: Construction and working of microwave components - coupling mechanisms, waveguide windows, tuning screws and posts, waveguide attenuators and phase shifters, waveguide multiport junctions. [Text Book-1]

Unit-II: Scattering matrix and Microwave tubes:

Scattering matrix for E plane and H plane tees, magic tee, directional coupler, Illustrative problems.

Microwave tubes: Limitations and losses of conventional tubes at microwave frequencies. Basic construction and operation - two cavity klystron, reflex klystron, TWT and Magnetron, (Qualitative treatment only) Illustrative Problems. [Text Book-2]

Unit -III: Microwave Solid State Devices and Measurements:

Classification, construction and working of TEDs and ATDs – gunn diode. Introduction to Avalanche Transit Time Devices – IMPATT & TRAPATT.

Microwave measurements: Set up of microwave bench, precautions, microwave power measurement – bolometer, measurement of attenuation, frequency, low and high VSWR and impedance. [Text Book-2]

Unit -IV: Radar Principles and Types:

Introduction to Radars - radar range equation, radar frequencies and applications, PRF, unambiguous range, radar cross section, integration of radar pulses. Construction and working of CW radar, CW radar with non-zero IF, FM CW radar, MTI and pulse doppler radar, delay Line canceller, blind speeds, staggered PRFs. [Text Book-3]

Unit-V: Tracking Radar and Radar Receivers:

Tracking with radar, basic principle and operation of sequential lobbing, conical scan, monopulse tracking radar – amplitude comparison monopulse (one- and two- coordinates).

Radar Receivers: Noise figure and noise temperature, duplexers – branch type and balanced type, circulators as duplexers. [Text Book-3]

Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 2008.
3. Introduction to Radar Systems-Merrill I. Skolnik, Third Edition, Mcgraw-Hill, 2001

References:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 2016.

Course Outcomes:

After completing the course, students will be able to

- Describe the significance of waveguides, microwave components, radar fundamentals and signals
- Analyze the working and characteristics of microwave tubes and different radars

- Explain and analyze operations of microwave solid state devices and radar systems
- Apply and analyze concepts of microwave junctions, scattering parameters for different components and radar signals detection
- Analyze and evaluate microwave measurements and radar receiver

IV-Year B.Tech-ECE-I-Semester **L/T/P C**

2/1/0 3

A57041 Cellular & Mobile Communication

Prerequisite: Analog Communication Systems and Digital Communication

Course Objectives:

- To illustrate the working principles and standardization of modern cellular communication systems to the students.
- To enable the student understand the concept of frequency reuse, handoff, channel assignment strategies and system capacity in cellular networks.
- To analyze the impact of fading on signal propagation in cellular networks
- To explore the principles of different equalization and diversity techniques
- To understand the concept of multiplexing and multiple access techniques used in communication networks

Unit-I: Introduction to Cellular Mobile Radio Systems (Text Book1): Limitations of Conventional Mobile Telephone Systems, Electromagnetic Spectrum, Wireless Communication Systems, How a Cellular Telephone Call is made, Comparative Study of Cellular Communication Networks- 2G, 3G, 4G, 5G, and Their Standardizations

Unit-II: Elements of Cellular Radio System Design (Text Book1): Operation of Cellular Systems, Concept of Frequency reuse, Channel Assignment Strategies, Handoff and Its types, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems - Cell Splitting, Sectoring, Microcell Zone Concept.

Unit-III: Mobile Radio Propagation (Text Book1, Text book 2):

Large Scale Fading: Introduction to Radio Wave Propagation, Free Space Propagation Model, Radio Propagation Mechanisms- Concept Reflection, Diffraction, and Scattering in brief, Phase Difference Between Direct and Reflected Paths, Path Loss Models: Log-distance Path Loss model, Log-normal Shadowing, Okumura model, Hata model

Small Scale Fading and Multipath: Small-Scale Multipath Propagation, Parameters of Mobile Multipath Channels, Types of Small Scale Fading, Rayleigh and Ricean Distribution

Unit–IV: Equalization and Diversity (Text Book1): Brief introduction to ISI and Eye diagram, Fundamentals of Equalization**,** Linear Equalizer, Non-linear Equalizer- Decision Feedback Equalizer, Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithm for Adaptive Equalizer- Zero Forcing (ZF) Algorithm, Least Mean Square (LMS)

Algorithm, Diversity Techniques- Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity, Mathematical Derivation of Selection Diversity Improvement

Unit–V: Multiplexing and Multiple Access Techniques (Text Book1): Introduction to Multiplexing- Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Wavelength Division Multiplexing (WDM), Introduction to Multiple Access- Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA), Capacity of Cellular TDMA and CDMA networks

Text Books:

1. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edition, 2002

2. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edition, 2006

References :

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2001

2. Modern Wireless communications- Simon Haykin, Michael Moher, Pearson Education, 2005

3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007

4. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005

Course outcomes:

After completing the course, students will be able to

- Understand the advantages, disadvantages, applications and standardization of different wireless communication technologies.
- Provide algorithms for designing and planning of cellular networks.
- Analyze the impact of fading in designing any cellular networks.
- Identify equalization and diversity techniques for designing efficient receivers
- Provide ideas in cellular network management

B.Tech-ECE IV-Year-I-Semester **L/ T/ P C**

3 / 0 / 0

3

A57042 Digital Image Processing

Prerequisite: Signals and Systems and Digital Signal Processing

Course objectives:

- To understand the fundamentals of digital image processing.
- To design and implement Spatial and frequency domain filtering
- To evaluate the different denoising techniques
- To apply segmentation techniques to isolate the object
- To build various compression algorithms

Unit-I: Digital Image Fundamentals & Image Transforms:
Digital image fundamentals, sampling and quantization, relationship between pixels. Image transforms: 2-D FFT, properties, Walsh transform, Hadamard Transform, Discrete Cosine transform, Haar transform.

Unit-II: Image Enhancement:
Image Enhancement in Spatial Domain: Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing operations, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter. Image enhancement frequency domain: Filtering in frequency domain, obtaining frequency domain filters from spatial filters. Generating filters directly in the frequency domain, low-pass (smoothing) and high pass (sharpening) filters in frequency domain.

Unit-III: Image Restoration:
Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

Unit-IV: Image Segmentation and Morphological Image Processing:
Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation.

Morphological Image Processing: Dilation and erosion, structuring element decomposition, the strel function. combining dilation and erosion: opening and closing, the hit or miss transformation.

Unit-V: Image Compression:
Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder. Error free compression, lossy compression, JPEG 2000 standards.

Text Books:

1. Rafael C. Gonzalez. Richard E. Woods, *"Digital Image Processing",* Third Edition, Pearson Education, 2008.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar , "*Digital Image Processing*", Tata McGraw Hill, 2010.

References:

1. Rafael C. Gonalez, Richard E. Woods and Steven L. Eddings, "*Digital Image Processing using MATLAB*", Second Edition, Tata McGraw Hill, 2010
2. A.K. Jain , "*Fundamentals of Digital Image Processing*", Prentice Hall India, 2015
3. Somka, Hlavac, Boyle, "*Digital Image Processing and Computer Vision*", Cengage learning (Indian edition), 2008.
4. Adrian low , "*Introductory Computer vision Imaging Techniques and Solutions*", Second Edition, 2008
5. John C. Russ, J. Christian Russ, "*Introduction to Image Processing & Analysis*", CRC Press, 2010

Course Outcomes:

After completing the course, students will be able to

- Acquire the fundamental knowledge in digital image processing
- Analyze the images in frequency domain and time domain
- Evaluate the existing techniques in image denoising
- Perform various morphological operations like opening and closing
- Categorize different compression techniques

B.Tech-ECE IV-Year-I-Semester **L/ T/ P C**

3 / 0 / 0 3

A57043 Software Defined Radio

Prerequisite: Analog Communication Systems, Digital Communication, Digital Signal Processing

Course Objectives:

- To identify the software and hardware requirements for designing a SDR network
- To explore the front end technology of SDR network
- To develop algorithms for signal processing in SDR network
- To design a SDR Network

Unit-I: Introduction to Software Defined Radio:

What is SDR - Definition of SDR, software radio (SR), adaptive intelligent SR, digital radio, multiband, and multimode. Architectural perspectives for SDR - radio implementer plane, network operator plane., SR Concepts, characteristics and benefits of SR, design principles of SR. (Text book-1,2)

Unit-II: Radio Frequency Translation for Software Defined Radio:

Requirements and specifications - transmitter specifications, receiver specifications. receiver design considerations - basic design considerations, receiver architectures - direct conversion architecture, multiple conversion architecture, low IF architecture., adjacent channel power ratio (ACPR) and noise power ratio (NPR), receiver signal budget. An approach to receiver design, transmitter design considerations: filtering analogies between receiver and transmitter, transmitter architectures- direct conversion, multiple conversion., candidate architectures for SDR: zero IF receivers, problems with zero IF architecture.

Unit-III: Data Conversion in Software Defined Radio:

The importance of data converters in SDR, converter architectures: analog to digital (A/D) converter- flash converter, multistage converter, sigma-delta converter. Digital to analog (D/A) converter- string converter., converter performance impact on SDR - noise sources, signal to noise ratio (SNR) of data converter, spurious impact on performance, digital to analog converter specification.

Unit-IV: Digital Hardware for Software Defined Radio:
Baseband component technologies, DSP processors: architectures - von Neumann and Harvard archituctures., DSP sotware developmemt cycle, field programmable gate arrays- applications of FPGA in SDR, design principles using FPGA, SDR baseband processing - -limitations of conventional IC Technologies.trade-offs of conventional IC technologies: limitations of microprocessor, DSP and ASIC implementations.

Unit-V: Software Technology for Software Defined Radio:

Overview of Vanu system, the importance of software in SR, Software download for mobile terminals - why software download, downloading technologies for SDR, security for download, software architectures for download., architecture of digital enhanced cordless telecommunications (DECT) reconfigurable demonstrator.

Text Books:

1. Walter Tuttlebee, "*Software Defined Radio: Enabling Technologies*", 1st Edition, John Wiley & Sons, 2003.
2. Jeffrey Hugh Reed, "*Software Radio: A Modern Approach to Radio Engineering*", 1st Edition, Prentice Hall Professional, 2002.

References:

1. Paul Burns, "*Software Defined Radio for 3G*",1st Edition, Artech House, 2003.
2. Markus Dillinger, Kambiz Madani, and Nancy Alonistioti, "*Software Defined Radio: Architectures, Systems and Functions*", 1st Edition, John Wiley & Sons, 2005.

Course Outcomes:

After completing the course, students will be able to

- Understand the principles of SDR.
- Understand the concept of multirate processing, A/D and D/A converter used in signal processing of SDR.
- Understand the design specifications of transmitter and receiver for SDR network
- Understand digital hardware required for SDR network .
- Understand the software technology for SDR network.

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0 3

A57044 Low Power VLSI Design

Prerequisite: VLSI design

Course Objectives:

- To understand the necessity of low power circuit design and various sources of power dissipation in CMOS transistors
- To learn the various low power techniques like voltage scaling, architectural level approach and switched capacitance minimization approach
- To apply the low power technique for adder and multiplier design implementation
- To design and analysis of low power RAM and ROM memory cell

Unit-I: Introduction to low power design:

Need for low power circuit design, sources of power dissipation – Switching power dissipation, short circuit power dissipation, leakage power dissipation, glitching power dissipation, short channel effects –drain induced barrier lowering and punch through, surface scattering, velocity saturation, impact ionization, hot electron effect.

Unit-II: Low-Power Design Approaches:

Low-power design through voltage scaling – VTCMOS circuits, MTCMOS circuits, architectural level approach –pipelining and parallel processing approaches.switched capacitance minimization approaches: system level measures, circuit level measures, mask level measures.

Unit-III: Low-Voltage Low-Power Adders:

Introduction, Standard Adder Cells, CMOS Adder Architectures – ripple carry adders, carry look-ahead adders, carry select adders, carry save adders, low-voltage low-power design techniques –trends of technology and power supply voltage, low-voltage low-power logic styles.

Unit-IV: Low-Voltage Low-Power Multipliers:

Introduction, overview of multiplication, types of multiplier architectures-braun multiplier, baugh-wooley multiplier, booth multiplier, wallace tree multiplier.

Unit-V: Low-Voltage Low-Power Memories:

Basics of ROM, low-power ROM technology, future trend and development of ROMs, Basics of SRAM, memory cell, precharge and equalization circuit, low-power SRAM technologies, basics of DRAM, self-refresh circuit, future trend and development of DRAM.

Text Books:

1. Sung-Mo Kang, Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", New York: McGraw-Hill, Second Edition, 2011.

2. Yeo, Kiat-Seng, and Kaushik Roy," *Low voltage, low power VLSI subsystems*", McGraw-Hill, Inc., 2004.

References:

1. Ming-BO Lin, "*Introduction to VLSI Systems: A Logic, Circuit and System Perspective*", CRC Press, First Edition, 2012.

2. AnanthaChandrakasan, "*Low Power CMOS Design*", IEEE Press/Wiley International, First Edition, 1998.

3. Kaushik Roy, Sharat C. Prasad, "*Low Power CMOS VLSI Circuit Design*", John Wiley & Sons, First Edition, 2009.

4. Gary K. Yeap, "*Practical Low Power Digital VLSI Design*", Kluwer Academic Press, 2002.

5. A. Bellamour, M. I. Elamasri, "*Low Power CMOS VLSI Circuit Design*",Kluwer Academic Press, 1995.

6. Siva G. Narendran, AnathaChandrakasan, "*Leakage in Nanometer CMOS Technologies*" Springer, Third Edition, 2005.

Course Outcomes:

After completing the course, students will be able to

- Understand about the sources of power dissipation and necessity of low power circuit design
- Analyze the low power technique in different levels of circuits
- Design the low power adder with various low power techniques
- Apply various low power architectures for low power multiplier implementation
- Analyze the future trend and development of RAM and ROM cell for low power design

B.Tech-ECE IV-Year-I-Semester **L/T/ P C**

3/0/0 3

A57045 Machine Learning & Artificial Neural Networks

Prerequisite: Introduction to Probability Theory & Statistics

Course Objectives:

- Understand the challenges, applications and models of Machine Learning
- Apply and evaluate supervised machine learning algorithms for classification and regression tasks
- Apply and evaluate unsupervised learning algorithms for clustering tasks
- Understand the Ensemble learning, apply and evaluate different type of these algorithms for better prediction.
- Understand the Artificial Neural Networks computational model

Unit-I: Introduction to Machine Learning

What is machine learning, why machine learning, types of machine learning models, challenges of machine learning, applications of machine learning, essential libraries and tools, generalization overfitting and underfitting, bias–variance trade-off, metrics

Unit-II: Supervised Learning

Classification and regression, linear regression: single and multiple, logistic regression, k-nearest neighbour, naive bayes classifier, decision tree, support vector machine

Unit-III: Unsupervised Learning and Pre-processing

Types of unsupervised learning, challenges in unsupervised learning, applications of unsupervised learning, pre-processing and scaling, clustering, K-Means Clustering, agglomerative clustering, comparing and evaluating the clustering algorithms.

Unit-IV: Ensemble Learning and Random Forest

Voting classifiers, bagging and pasting, random patches and random subspaces, random forest, boosting-AdaBoost and Gradient Boost.

Unit-V: Artificial Neural Networks

Introduction, understanding the biological neuron, exploring the artificial neuron, types of activation functions, early implementations of ANN, architectures of neural network: single-layer & multi-layer feed forward ANNs, recurrent network, learning process in ANN, backpropagation

Text Books:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das "*Machine Learning*", Pearson Education India, 2018.
2. Aurélien Géron, "*Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts,Tools, and Techniques to Build Intelligent Systems*" O'Reilly Media, Inc, 2017.

References:

1. Andreas C. Müller, Sarah Guido, "*Introduction to Machine Learning with Python*", O'Reilly Media, Inc, October 2016.
2. Tom M. Mitchell, "*Machine Learning*", McGraw-Hill Education (India) Private Limited, 2013.
3. Ethem Alpaydin, "*Introduction to Machine Learning (Adaptive Computation and Machine Learning)*", The MIT Press, 2004.
4. Stephen Marsland, "*Machine Learning: An Algorithmic Perspective*", CRC Press, 2009.

Course Outcomes:

After completing the course, students will be able to

- Understand the essentials of feature engineering, state-of-art tools and concepts of machine learning
- Design and evaluate different types of supervised learning algorithms for classification and regression tasks.
- Design and evaluate different types of unsupervised learning algorithms for clustering tasks.
- Design and evaluate strong learners for better real time prediction ensemble learning algorithms
- Design Artificial Neural Networks computational model.

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0 3

A57046 Analog VLSI Design

Prerequisite: Electronic Circuit Analysis, Pulse & Integrated Circuits

Course objectives:

- To provide in-depth understanding of the analog circuits and building blocks
- To Understand the MOSFET models, small signal analysis
- To provide a basic knowledge on current mirror and amplifier design
- To understand the operation and analysis of comparators

Unit-I: Introduction to analog designand Basic MOS device physics:

Need of analog design and Complementary MOS (CMOS), Level of abstraction, robust analog design.

Basic MOS device physics:Metal-oxide-semiconductor (MOS) switch, MOS structure, symbols, threshold voltage, derivation of V-I characteristics, body effect, channel length modulation, subthreshold conduction.

Unit-II: MOS device Models:

MOS device capacitances, Small signal model, NMOS versus PMOS devices. Passive and Active current mirrors:basic current mirrors, cascade current mirrors, active current mirrors, large signal analysis, small signal analysis, common mode properties.

Unit-III: Single stage and differential amplifiers:

Common-source stage with resistive load, diode connected load, current source load, source follower, common gate stage.

Differential amplifiers: single-ended and differential operation, basic differential pair: qualitative and quantitative analysis, common - mode response, differential pair with MOS loads.

Unit-IV: Operational Amplifiers:

General considerations- performance parameters, One stage op-amp, Two stage op-amp, gain boosting, comparison, input range limitations, slew rate, power supply rejection.

Unit-V:Comparators:

Comparator specifications, using an op-amp for a comparator, charge-injection errors, latched comparators, example of CMOS comparators.

Text Books:

1. Behzad Razavi, *"Design of analog CMOS integrated circuits"*, Mc - Graw Hill international edition 2001.

2. Tony Chan Carusone, David A. Johns, Kenneth W. Martin *"Analog integrated circuit design",* Wiley, 2nd Edition.

Reference Books:

1. Philip E. Allen and Douglas R. Holberg, *"CMOS analog circuit design"*, oxford university Press, international 2nd edition/Indian edition, 2010.
2. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, *"Analysis and design of analog integrated circuits",* Wiley India, 5th Edition, 2010.
3. Baker, Li and Boyce, *"CMOS: Circuit design, layout and simulation"*, PHI.

Course outcomes:

After completing the course, students will be able to

- Understand the MOS fundamentals, analog and basic building blocks design.
- Know the, small signal models and analysis of MOSFET based circuits such as current mirrors
- Analyze and design analog circuits such as single stage and differential amplifiers.
- Analyze and design of operational amplifiers and the performance parameters
- To design of comparators using operational amplifiers.

IV-Year B.Tech-ECE-I-Semester **L/T/P C**

3/0/0 3

A57047 Advanced Communications and Networks

Prerequisite: Analog Communication Systems and Digital Communications

Course Objectives:

- To illustrate the working principles and standardization of modern cellular communication systems to the students.
- To enable the student understand the concept of frequency reuse, handoff, channel assignment strategies and system capacity in cellular networks.
- To analyze the impact of fading on signal propagation in cellular networks
- To explore the principles of different equalization and diversity techniques
- To understand the concept of multiplexing and multiple access techniques used in communication networks

Unit-I: Orthogonal Frequency Division Multiplexing (OFDM):

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Windowing in OFDM Signal and Spectrum, Synchronization in OFDM, Channel Estimation, Limitations in OFDM, FFT Point Selection Constraints in OFDM

Unit-II: Multiple Input Multiput Output (MIMO):

Introduction, Space Diversity, System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond

Unit-III:Wireless LANs/IEEE 802.11x:

Introduction to IEEE802.11x Technologies, Evolution of wireless LANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing

Wireless Technologies, Typical WLAN Hardware

Unit–IV: Wireless PANs/IEEE 802.15x:

Introduction to IEEE 802.15x Technologies: Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards

Unit–V: Broad Band Wireless MANs/IEEE 802.16x:

Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical Layer Details, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.

Text Books:

1. Gary J. Mullett, "Introduction to Wireless Telecommunications Systems and Networks", CENGAGE
2. Upena Dalal, "Wireless Communication", Oxford University Press, 2009

References :

1. Ke-Lin Du & M N S Swamy, "Wireless Communication System", Cambridge University Press, 2010
2. Gottapu Sasibhusan Rao, "Mobile Cellular Communication", PEARSON

Course outcomes:

After completing the course, students will be able to

- Understand the advantages, disadvantages, applications and standardization of different wireless communication technologies.
- Provide algorithms for designing and planning of cellular networks.
- Analyze the impact of fading in designing any cellular networks.
- Identify equalization and diversity techniques for designing efficient receivers
- Provide ideas in cellular network management

B.Tech-ECE IV-Year-I-Semester

L/T/ P C

3/0/0 3

A57048 Antenna Theory & Design

Prerequisite: Electromagnetics and Transmission Lines

Course Objectives:

- To understand the applications of the electromagnetic waves in free space.
- To learn the working principles of various types of basic and advanced antennas
- To discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- To understand the concepts of different Antennas.

Unit-I: Antenna Basics:

Introduction, basic antenna parameters-patterns, beam area, radiation intensity, beam efficiency, directivity-gain - resolution, antenna apertures, effective height. Fields from oscillating dipole, field zones, antenna theorem. Half wave dipole – current distributions, field components, radiated power, radiation resistance, beam width, directivity, effective area and effective height, related problems

Unit-II: Antenna Arrays:

Point Sources-Definition, patterns, arrays of 2 isotropic sources- different cases, principle of pattern multiplication, uniform linear arrays – broadside, end fire arrays. Derivation of their characteristics and comparison, BSA's with non-uniform amplitude distributions-general considerations and binomial arrays, illustrated problems

Unit-III: VHF, UHF and Microwave Antennas - I:

Arrays with parasitic elements, Yagi - Uda arrays, folded dipoles & their characteristics. Helical antennas- helical geometry, helix modes, practical design considerations for nonfoliar helical antennas in axial mode and normal modes. Horn antennas-types, fermat's principle, optimum horns, design considerations of pyramidal horns, related problems.

Unit-IV: VHF, UHF and Microwave Antennas - II:

Micro strip antennas- advantages and limitations, rectangular patch antennas-geometry and parameters, characteristics of micro strip antennas. Impact of different parameters on characteristics paraboloidal reflectors-geometry, pattern characteristics, feed methods, reflector types-related features. Illustrative problems. Lens antennas – introduction, geometry of non-metallic dielectric lenses, zoning, tolerances, and applications.

Unit-V: Antenna Measurements:

Reciprocity, sources of errors, pattern measurement arrangement, directivity measurement, gain measurements by comparison, absolute and 3-antenna methods. Introduction to turnstile antenna.

Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, *"Antennas and wave propagation*, TMH 4th Edition., Indian edition 2010.

2. C.A. Balanis, *"Antenna Theory and Design"*, John Wiley & Sons, 3rd ed., 2005.

References:

1. E.C. Jordan and K.G. Balmain, *"Electromagnetic Waves and Radiating Systems",* PHI, 2nd ed., 2000.

2. K.D. Prasad, *"Antennas and Wave Propagation",* SatyaPrakashan, Tech India Publications, New Delhi, 2001.

3. E.V.D. Glazier and H.R.L. Lamont, *"Transmission and Propagation - The Services Text Book of Radio, volume 5"*, Standard Publishers Distributors, Delhi.

4. F.E. Terman *"Electronic and Radio Engineering",* McGraw-Hill, 4th edition, 1955.

5. John D. Kraus, *"Antennas",* McGraw-Hill International Edition Second Edition, 1988.

Course Outcomes:

After completing the course, students will be able to

- Apply Maxwell's equations to calculate fields from dynamic current distributions.
- Analyze various antenna types and its radiating systems
- Design antenna system including shape of antenna, feed property, given radiation pattern, gain operating frequency, transmitted / received power.
- Compare different design parameters of different antennas
- Illustrate techniques for measuring antenna parameters

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0

3

A57049 Optical Communication

Prerequisite: Applied Physics, Electronic Devices & Circuits

Course Objectives:

- To realize the significance of optical fiber communications.
- To understand the construction and characteristics of optical fiber cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and wave length division multiplexing.

Unit-I: Optical Fiber Construction & Materials:

Historical development, the general system, advantages of optical fiber communications, optical fiber wave guides – introduction, ray theory transmission, total internal reflection, acceptance angle, numerical aperture, skew rays. cylindrical fibers – modes, v-number, mode coupling, step index fibers, graded index fibers. single modes fibers – cut off wavelength, mode field diameter, effective refractive index. fiber materials – glass, halide, active glass, chalgenide glass, plastic optical fibers.

Unit-II: **Signal Distortion & Connectors**:

Signal distortion in optical fibers – attenuation, absorption, scattering and bending losses, core and cladding losses. Capacity determination, group delay, types of dispersion – material dispersion, wave – guide dispersion, polarization mode dispersion, intermodal dispersion. Pulse broadening. Optical fiber Connectors – Connector types. Fiber splicing – splicing techniques, splicing single mode fibers. Fiber alignment and joint loss.

Unit-III: Optical Sources & Detectors:

Light Emitting Diodes (LED's), structures, materials, quantum efficiency, power modulation, power bandwidth product. injection laser diodes – modes, threshold conditions, external quantum efficiency, laser diode rate equations, resonant frequencies. reliability of light emitting diodes (LED) & Injection Laser Diodes (ILD). Source to fiber power launching – output patterns, power coupling, power launching, equilibrium numerical aperture, laser diode to fiber coupling. Transmission distance, line coding in optical links, physical principles of pin and avalanche photo diodes (apd), detector response time, temperature effect on avalanche gain, comparison of photo detectors.

Unit-IV: Receivers & Wavelength Division Multiplexing:

Necessity, principles, types of wave length division multiplexing (WDM), measurement of attenuation and dispersion, eye pattern. Optical receiver operation – Fundamental receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers.

Unit-V: Optical system design:

Considerations, component choice, multiplexing. Point – to – point links, system considerations, link power budget with examples. Overall fiber dispersion in multimode and single mode fibers, rise time budget with examples.

Text Books:

1. Gerd Keiser, *"Optical Fiber Communications"* , McGraw Hill International edition, 3 rd edition, 2000.
2. John M. Senior, *"Optical Fiber Communications"*, PHI, 2nd edition, 2002.

References:

1. D.K.Mynbaev, S.C.Gupta and Lowell L.Scheiner, "*Fiber Optic Communications"*, Pearson Education, 2005.
2. S. C. Gupta, "*Text Book on Optical Fiber Communication and Its Applications"*, PHI, 2005.
3. Govind P Agarwal, *"Fiber Optic Communication Systems"*, 3rd edition,, John Wiley, 2004.
4. Joseph C. Palais, *"Fiber Optic Communication Systems",* 4th edition, Pearson Education, 2004.

Course Outcomes:

After completing the course, students will be able to

- Explain and analyze the constructional parameters of optical fibers.
- Design an optical system.
- Estimate the losses due to attenuation, absorption, scattering and bending
- Compare various optical detectors and choose suitable one for different applications
- Analyze analogue and digital links. describe the various criteria power loss wavelength to be considered for point-to-point link in digital link system

B.Tech-ECE IV-Year-I-Semester **L/T/ P C**

3/0/0 3

A57050 Biomedical Signal Processing and Telemedicine

Prerequisite: Signals and Systems and Digital Signal Processing

Course Objectives:

- To understand the fundamentals of discrete-time signals and systems for biomedical signal analysis
- To learn about various types of wavelet transforms that are used to describe, analyze and process biomedical signals
- To analyze and preprocess the EEG signal using spectral analysis, segmentation and filters
- To apply the methods to extract relevant information from EMG signals
- To develop various methods for extracting the ECG signal feature extraction and heart rate variability analysis

Unit-I: Fundamentals of Discrete-Time Signals and Systems:

Concepts of systems and signals, sampling process, impulse response, discrete transfer function**.** Wavelets: Continuous wavelet transform, discrete wavelet transform, reconstruction, recursive multi resolution decomposition, Types of wavelets-Haar wavelet, Daubechies wavelet, Biorthogonal wavelet, Coiflet wavelet.

Unit-II: The Electro Encephalo Gram (EEG):

Applications, signal processing, modeling and artifacts nonparametric and model-based spectral analysis, eeg segmentation, joint time-frequency analysis, evoked potential modalities, noise characteristics, noise reduction by ensemble averaging and linear filtering, single-trail analysis and adaptive analysis using basis functions.

Unit-III: Electro Myo Gram (EMG): The electrical activity of muscles, amplitude estimation in the surface EMG, spectral analysis of the surface EMG, conduction velocity estimation, modelling the EMG, EMG signal decomposition.

Unit-IV: Electrocardiogram (ECG): Heart rhythms, heartbeat morphologies, noise and artifacts, baseline wander, power line interference, muscle noise filtering, QRS detection, wave delineation, data compression, heart rate variability, acquisition and rr interval conditioning, spectral analysis of heart rate variability.

Unit-V: Introduction of Telemedicine:

History of telemedicine, block diagram of telemedicine system, definition of telemedicine, tele health, tele care, origin & development of telemedicine, scope, benefits and limitation of telemedicine.

Text Books:

1. Willis J. Tompkins, "*Biomedical Digital Signal Processing*", Prentice-Hall, first edition, 1993.
2. Leif Sornmo and Pablo Laguna,"*Bioelectrical Signal Processing in Cardiac and Neurological Applications*", Academic Press, 2005

Reference Books:

1. Rangaraj M. Rangayyan, Akay Metin(Editor), "*Biomedical Signal Analysis: A Case Study Approach*", Wiley Interscience John Willey & Sons,INC., Second Edition, 2015.
2. Roberto Cristi, "*Modern Digital Signal Processing*", 2004.
3. James V. Stone, "*Independent Component Analysis: A Tutorial Introduction*", MIT Press,2004

Course Outcomes:

After completing the course, students will be able to

- Learn discrete fourier transform, fast-Fourier transform and z-transform to analyze the biomedical signals for medical applications
- Understand various wavelet transforms to analyze the biomedical signals for medical applications
- Apply spectral analysis, segmentation and filtering for EEG diagnosis.
- Analyze EMG for estimating the amplitude and conduction velocity.
- Utilize the preprocessing techniques and extract the features of ECG signal for diagnosis.

B.Tech-ECE IV-Year-I-Semester
L/T/ P C

3/0/0 3

A57051 Adaptive Signal Processing

Prerequisite: 1. Signals and Systems and Digital Signal Processing

Course Objectives:

- To learn and able to visualize the domain of adaptive signal processing
- To identify a random process and formulate to extract desired information
- To develop algorithms meeting application specific performance criteria
- Toverify the adaptive algorithms in software or hardware

Unit-I: Introduction to Adaptive Systems:

Review of digital signal processing, adaptive System - definitions, characteristics, applications. Adaptive linear combiner – description, weight vectors. desired response performance function – gradient and mean square error.

Unit-II: Wiener Filters:

Linear optimum filtering – Minimum mean-square error,Wiener- Hopf equations, multiple linear regression model, steepest-descent algorithm. Linear prediction – forward linear prediction, Levinson-Durbin algorithm. Kalman filter, extended kalman filter.

Unit-III: Least Mean Square (LMS) Adaptive Filters:

LMS algorithm, LMS adaptation algorithm and applications. Method of least squares – data windowing, normal equations and linear least square filters, recursive least squares algorithm.

Unit-IV: Frequency Domain Filters:
Frequency domain adaptive filters, adaptive lattice filters, adaptive infinite impulse response filtering, blind adaptive filtering, Haykin cost functions. Higher-order statistics.

Unit-V: Applications of Adaptive Signal Processing:

Adaptive modeling and system identification,inverse adaptive modeling, deconvolution and equalization, adaptive control systems, adaptive interference canceling - canceling noise, canceling periodic interference, canceling interference in ECG signals.

Text Books:

1. B. Widrow and S. D. Sterns, ”*Adaptive Signal Processing”*, Pearson Education , 2nd Indian reprint, 2002.
2. Simon Haykins, “*Adaptive Filter Theory*”, Pearson Education, Fifth Edition, 2013.

Reference Books:

1. J. Benesty, Y. Huang," *Adaptive Signal processing: Applications to Real World Problems",* Springer, 2003.

2. D. G. Manolakis, V.K. Ingle, S.M. Kogon, "*Adaptive Signal Processing",* McGraw-Hill , 2000.

3. John. R. Triechler, C. Richard Johnson (Jr), Michael. G. Larimore, "*Theory and Design of Adaptive Filters*", Prentice Hall India Private Limited, 2004.

Course Outcomes:

After completing the course, students will be able to

- Devise filtering solutions for optimising the cost function indicating error in estimation of parameters and appreciate the need for adaptation in design.
- Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters of stationary random process clearly considering practical application specifications.
- List and apply the various mathematical models to adaptive signal processing
- Design and implement filtering solutions for applications such as channel equalization, interference cancelling and prediction considering present day challenges.
- Use computer-based simulation tools to understand the theoretical concepts of adaptive signal processing in various communication applications.

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0 3

A57052 Organic and Flexible Electronics

Prerequisite: Applied Physics, Engineering Chemistry and Electronic Devices & Circuits

Course Objectives:

- To gain a fundamental understanding to the field of organic and printed electronics.
- Introduction to advanced electronics materials and their potential impact
- Introduction to sophisticated characterisation techniques and advanced electronics devices
- To understand the basic concepts for integration of thin-film devices on flexible platforms and the advantages and disadvantages of emerging technology.
- To provide students with a broad overview of organic electronic materials and devices with emphasis of research and practical applications.

Unit-I: Introduction to Organic and Flexible Electronics

Introduction to flexible and organic electronics, their materials systems, background, trends, emerging technologies, general applications. [Textbook-1]

Unit-II: Organic Semiconducting Materials

Review of inorganic semiconductors, properties. Review of organic semiconductor: Conjugated small molecules and polymers, electronic structure, hybridization of atomic orbitals, molecular orbitals, charge injection and transport. [Textbook-1]

Unit-III: Thin Films Processing Techniques

Thin-film Deposition and Processing Methods: Evaporation Methods-CVD, PECVD, PVD, Coating Techniques-Spin Coating, Slot-die coating, Blade Coating. Printing Technique: Inject printing, Screen Printing, Gravure printing. [Textbook-1&2]

Unit-IV: Characterization Techniques for Flexible Electronics

Structural Characterisation: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Forced Microscopy (AFM), X-ray Diffraction (XRD). Spectroscopic Characterisation: Infra-Red (IR), UV-visible and Raman. [Textbook-1&2]

Unit-V: Organic and Flexible Electronics Devices: Review of PN junction diodes, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs), Organic Thin-film transistors (OTFTs), Organic Light-emitting Diodes (OLEDs), Organic Solar cells (OSCs) and their electrical measurements. [Textbook-1&2]

Text Books:

1. Giovanni Nisato, Donald Lupo and Simone Ganz, "*Organic and Printed Electronics Fundamental and Applications*", Taylor & Francis, 1st Edition, 2016.
2. Stergios Logothetidis, "*Handbooks of Flexible Organic Electronics- Materials Manufacturing and applications*" Elsevier, 2015.

Reference Books:

1. Zhenan Bao and Jason Locklin, "*Organic Field-Effect Transistors*" CRC Press, 1st Edition, 2007.
2. Ioannis Kymissis, "*Organic Field-Effect Transistors: Theory, Fabrication and Characterization*", 1st Edition, Springer, 2009.
3. Qiquan Qiao, "*Organic Solar Cells: Materials, Devices, Interfaces, and Modeling*", 1st Edition, CRC Press, 2015.

Course Outcomes:

After completing the course, students will be able to

- To know about flexible electronics and its possibilities in the industry.
- To understand about various organic materials and their electronics products.
- To understand about different fabrication and characterization methods used in this field.
- To understand about characterization techniques for flexible electronics
- To understand the opportunities and advancements in this advanced field of electronics.

B.Tech-ECE IV-Year-I-Semester

L/T/ P	**C**
3/0/0	**3**

A57053 Satellite Communication

Prerequisite: Analog Communication Systems and Digital Communications

Course Objectives:

- To acquire foundation in orbital mechanics and launch vehicles for satellites.
- To gain basic knowledge of link design of satellite.
- To understand multiple access systems and earth station technology
- To understand the concepts of satellite navigation and GPS.

Unit-I: Introduction:

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital

Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

Unit-II: Satellite Subsystems:

Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and Gain of Antenna to Temperature of Antenna (G/T) ratio, Design of Down Links, Up Link Design, Design of Satellite Links for Specified Carrier signal to Noise Signal (C/N), System Design Examples.

Unit-III: Multiple Access:

Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of Carrier signal to Noise Signal (C/N), Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, Demand Assigned Multiple Access (DAMA), Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

Unit-IV:Low Earth Orbit and Geo-Stationary Satellite Systems:

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational Non-Geo-Stationary Satellite Orbit (NGSO) Constellation Designs.

Unit-V:Satellite Navigation & Global Positioning System:

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, GPS Receiver Operation, GPS Coarse Acquisition (C/A) Code Accuracy, Differential GPS,

Very Small Aperture Terminal (VAST), Mobile Satellite services: GSM, Direct Broadcast Satellites (BDS), Direct to Home Broadcast (DTH), Specialized Services-Video Conferencing, Internet.

Text Books:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, *"Satellite Communications"*, Wiley Publications, 2nd Edition, 2003.
2. Dennis Roddy,*" Satellite Communications"*, McGraw Hill, 4th Edition, 2009.

Reference Books:

1. M. Richharia, *Satellite Communications*: Design Principles, BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, *Satellite Communication*, Khanna Publications, 5th Ed.

3. K.N. Raja Rao, *Fundamentals of Satellite Communications*, PHI, 2004

4. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, *Satellite Communications Engineering*, 2nd Edition, Pearson Publications, 2003.

Course Outcomes:

After completing the course, students will be able to

- Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
- Envision the satellite sub systems and design satellite links for specified C/N.
- Understand the various multiple access techniques for satellite communication systems and earth station technologies.
- Know the underlying concepts of state-of-the-art LEO, GEO Stationary Satellite Systems and satellite navigation

B.Tech-ECE IV-Year-I-Semester **L/T/P** **C**

0/0/2 **1**

A57207 Microwave & Digital Communications Lab

Course objectives:

- To establish in micro wave bench and understand, analyze the functionality of different microwave components and devices
- To understand and analyze the functionality of different optical components and devices
- To operate and characterized the behaviour of micro wave and optical sources
- To measure and evaluate different micro wave parameters and quantities
- To measure and evaluate different optical parameters and antennas.

Note: Minimum of 12 Experiments to be conducted

PART –A: Microwave Engineering (Any 6 Experiments):

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Impedance of a given load
7. Measurement of Scattering parameters of a Magic Tee
8. Measurement of Scattering parameters of a Circulator
9. Attenuation Measurement
10. Microwave Frequency Measurements.

PART-B: **Digital Communications Lab (Any 6 Experiments):**

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Time Division Multiplexing of 2 Band Limited Signals
5. Frequency shift Keying: Generation and Detection
6. Phase Shift Keying: Generation and Detection
7. Amplitude Shift Keying: Generation and Detection
8. Study of the Spectral characteristics of PAM, QAM
9. DPSK: Generation and Detection
10. QPSK: Generation and Detection

Requirements:

1. Klystron power supplies
2. Gun Power supplies
3. Reflex Klystron benches
4. Gunndiode benches
5. Optical trainer kits
6. CROs
7. Function Generators
8. Multimeters

Digital Communication Lab
CRO: 0-20MHz ;0-60MHz
Function Generators:0-1MHz
Experimental Kits

Course outcomes:

After completing the course, students will be able to

- Establish and evaluate microwave test bench, microwave components and devices
- Describe and evaluate different optical components and devices
- Operate and analyze the characteristics of micro wave and optical sources
- Measure and evaluate different micro wave parameters and quantities
- Measure and evaluate different optical parameters and antennas

B.Tech-ECE IV-Year-I-Semester

L/T/ P C

0/0/2 1

A57208 Cellular & Mobile Communication Lab

Course Objectives:

- To understand the characteristics of small scale and large scale fading
- To analyse the impact of fading on the performance of different modulation techniques
- To observe the impact of Inter Symbol Interference (ISI) with Eye diagram
- To analyse the performance of equalization and diversity techniques in cellular networks
- To observe the performance of different multiple access techniques

List of Experiments (Any Ten Experiments are to be performed)

1. To analyse the characteristics of Friis free space path loss model, Log distance path loss model, Hata path loss model
2. To study different small scale fading parameters such as Power delay profile, Doppler spectrum, Frequency correlation function
3. To analyse the PDFs of Rayleigh and Rician fading channel
4. To analyse the performance of BPSK and QAM modulation techniques under Rayleigh fading channel
5. To analyse the performance of BPSK modulation technique with different diversity combining schemes
6. To observe the performance of 2x2 Multiple Input and Multiple Output (MIMO) technique under AWGN channel
7. To estimate the channel capacity of Single Input and Single Output (SISO) and Multiple Input and Multiple Output (MIMO) communication networks
8. To observe the impact of Inter Symbol Interference (ISI) with Eye diagram
9. To analyse the performance of Zero Forcing (ZF) and Minimum Mean Square Error (MMSE) equalisation techniques
10. To analyse the performance of Code Division Multiple Access (CDMA) technique
11. To simulate Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM)
12. To simulate Orthogonal Frequency Division Multiplexing (OFDM) multicarrier technique

Course Outcomes:

After completing the course, students will be able to

- Estimate the behaviour of cellular networks in different network scenarios
- Analyse the error rate of modulation techniques under fading channels
- Explore the efficacy of diversity techniques in cellular networks
- Provide solutions to design receivers that can handle the effects of ISI
- Analyse the impact of multi-carrier modulation and multiple access techniques in cellular networks

B.Tech-ECE IV-Year-II-Semester

L/T/P	**C**
2/1/0	**3**

A58002 Intellectual Property Rights

Course Objective:

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Unit-I: Introduction to IPR:

Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

Unit-II: Trademarks:

Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Unit-III: Law of Copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

Unit-IV: Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

Unit-V: Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Textbooks:

1. Deborah. E. Bouchoux,*"Intellectual property right"*, 5/e,cengage learning, 2018.
2. Neeraj Pandey, *"Intellectual property right"*, PHI, 2019.

Reference Books:

1. Ramakrishna Chintakunta and M. Geethavani,
2. Prabuddha Ganguli,*"Intellectual Property Right:Unleashing the Knowledge Economy"*, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

Course Outcomes:

After Completing the course, students will be able to

- Explain the concepts of intellectual property rights and related agencies.
- Describe the purpose and functions of a trademark in a competitive environment.
- Analyze the process of copyright and procedure.
- Understand the process of patent and patent issues.
- Explore the trade secret and geographical indications of its protection from unfair practices.

IV-Year B.Tech-ECE-II-Semester **L/T/P C**
2/1/0 3

A58016 Python Programming

Pre requisites
None

Course Objectives
1. Understand the basics and function of Python Programming Language.
2. Understand the string operation and sequences used in Python Programming Languages.
3. Understand the data structures used in Python Programming Languages.
4. Know the classes and objects in Python Programming Language.
5. Use the reusability concepts in Python Programming Language.

Course Outcomes
At the end of this Data Structures course, students will be able to:
1. Apply control structures, functions and packages in Problem Solving. (L3)
2. Analyze various String handling functions and data structures(L4)
3. Model the object-oriented problems with classes and objects (L4)
4. Solve the problems by using Inheritance and polymorphism (L3)
5. Illustrate programs on Exception Handling and various packages(L3)

Unit-I
Introduction to Python:
Features of Python Language, Data Types, Operators, Expressions, Control Statement, Standard I/O Operations.
Functions and Modules:
Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules, Packages in Python, Doc Strings.

Unit-II
Strings and Regular Expressions:
String Operations, Built-in String Methods and Functions, Comparing Strings, function in Regular Expression.
Sequence: List, Tuples, Dictionaries, Sets.

Unit-III
Introduction to Object Oriented Programming: Features of OOP,Merits and demerits of Object Oriented Programming Languages,Applications of OOP
Implementation of classes and objects in Python:
Classes and Objects, Class Method and Self Argument. The __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects).

Unit-IV
Implementation of Inheritance in Python:

Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces, Meta class,

Implementation of Operator Overloading in Python:

Introduction, Implementing Operator Overloading, Overriding Methods

Exception Handling in Python:

Introduction, Exception hierarchy, Handling Exception, Multiple Except Blocks and Multiple Exceptions, Finally Block.

Unit-V

Python NumPy: NumPy ND array, Data Types, Functions of NumPy Array, NumPy Array Indexing, Mathematical Functions on Arrays in NumPy

Python Pandas: Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames. Import data from csv file.

Introduction to Matplotlib:, Plot, Scatterplot, Introduction to Tkinter ,Date and Time Packages

Text Books

1.ReemaThareja,Python Programming using Problem Solving Approach, First Edition,Oxford Higher Eduction,2017

2.James Payne, Beginning Python using Python 2.6 and Python 3,1st Edition

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python, 2013
2. https://www.programiz.com/python-programming
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

B.Tech-ECE IV-Year-II-Semester
L/T/P C

2/1/0 3

A58014 Disaster Preparedness And Planning

Course Objectives

- To know the concept, definition and terminology of the Disaster Management.
- To know the classification and occurrence of disasters in India and elsewhere.
- To know and analyze the socio-economic, environmental aspects of disasters impacts.
- To know the pre, post and emergency management mitigation strategies.
- To know the environment of vulnerable disaster areas

Unit-I: Introduction: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

Unit-II: Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

Unit-III:Disaster Impacts:
Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

Unit-IV: Disaster Risk Reduction (DRR):
Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster
Management Authority.

Unit-V: Disasters, Environment And Development
Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods
.

Textbooks

1. H.K. Gupta, Disaster Management - - University Press, India, 2003.
2. Singh B.K, Handbook of Disaster Management: techniques and Guidelines -., Rajat, Publications, 2008

References

1. Pardeep Sahni, Disaster Mitigation: Experiences and Reflections -
2. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall, 2004.

Course Outcomes

After Completing the course, students will be able to

- Acquire knowledge of disaster Management.
- Acquaint with different disasters in India and other parts of the world.
- Classify, assess the magnitude and intensity of various impacts of disasters.
- Learn the management methods.
- Learn effective sustainable environmental modification techniques.

B.Tech-ECE IV-Year-II-Semester

L/T/ P C

2/1/0 3

A58017 Introduction to Deep Learning

Course Objectives

- To understand the concept of Deep Learning
- To understand various CNN Architectures
- To learn various RNN model
- To familiarize the concept of Autoencoder
- To apply Transfer Learning to solve problems

Course Outcomes

At the end of this course, students will be able to:

- Understand the fundamental issues and basics of deep learning
- Understand the concept of CNN to apply it in the Image classification problems
- Analyze the various RNN methods for sequence of input and Generative model for image generation
- Analyze the working of various the Autoencoders methods
- Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT-I

Deep Learning: Fundamentals, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Momentum, learning rate Decay, Dropout, Cross Entropy loss function.

UNIT-II

Deep Learning: Activation functions, initialization, regularization, batch normalization, model selection, ensembles. **Convolutional neural networks**: Fundamentals, architectures, striding and padding, pooling layers, CNN -Case study with MNIST, CNN vs Fully Connected.

UNIT-III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM, video to text with LSTM models.

UNIT-IV

Autoencoders and GAN: Basics of auto encoder, comparison between auto encoder and PCA, variational auto encoders, denoising auto encoder, sparse auto encoder, vanilla auto encoder, Multilayer autoencoder. Convolutional autoencoder, regularized auto encoder. GAN, Image generation with GAN.

UNIT-V

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc.,2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville,“Deep Learning”, MIT Press, 2015
3. Dipanjan Sarkar,Raghav Bali, “Transfer Learning in Action”, Manning Publications,2021

References

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

OS FOR AUTOMOTIVE APPLICATIONS

BTech IV year II Semester						Department of Electronics and communication Engineering		
Code	Catgory	Hours/Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
	OE	2	1	0	3	50	50	100

PRE-REQUISITES - Microprocessor/Microcontroller, C/C^{++} Programming & Embedded Systems

COURSE OBJECTIVES:

By the end of this course, students will:

1. Understand the basic structures of OS, and know the OS related commands
2. Understand the architecture and core concepts of the QNX RTOS.
3. Gain knowledge of process and thread management, including synchronization techniques.
4. Explore inter-process communication (IPC) methods and their applications in QNX .
5. Understand hardware programming concepts, including interrupt handling and memory access.

UNIT-1 OPERATING SYSTEMS: Brief History of OS, introduction to Unix/Linux , types of Kernels, overview of Unix/Shell commands, POSIX functions for process, threads and file operations. Definition of RTOS, Characteristics of RTOS, types of RTOS and applications of RTOS.

UNIT-2 QNX OS ARCHITECTURE: microkernel, process manager, and standards. Protected address spaces, process/thread model, and scheduling. Introduction to inter-process communication (IPC) and synchronization. Resource managers and shared objects.

UNIT-3 PROCESSES, THREADS, AND SYNCHRONIZATION: Process management: creation, termination, and memory protection. Thread management: creation, termination, and synchronization. Synchronization techniques: mutexes, semaphores, and condition variables. Programs on process/thread creation and synchronization.

UNIT-4 INTER-PROCESS COMMUNICATION (IPC) : Overview of IPC methods in QNX: message passing, pulses, and shared memory. Comparing IPC methods: advantages and disadvantages. Practical implementation of IPC in QNX. Programs on message passing and shared memory.

UNIT-5 HARDWARE PROGRAMMING AND TIMING: Hardware access methods: IO-mapped and memory-mapped IO. Interrupt handling and DMA-safe memory allocation. Timing architecture: periodic timing, one-shot timing, and timeouts. Programs on: interrupt handling and timing mechanisms.

BOOKS AND REFERENCES

TEXT BOOKS:

1. Programming for Embedded Systems, Michael Barr, O'Reilly Media.
2. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 9th Edition, Wiley, 2018
3. Hands-on RTOS with Microcontrollers, Brian Amos, Packt Publishing, 2020. 4.. 5. Online Resource o QNX online training o QNX training material

REFERENCES:

1.QNX Neutrino RTOS User's Guide, QNX Software Systems
2.Hands-on RTOS with Microcontrollers, Brian Amos, Packt Publishing, 2020.

COURSE OUTCOMES:

At the end of the course, students will be able to:

CO1- Develop Knowledge on RTOS and standards like POSIX
CO2- Describe the QNX OS architecture and its microkernel-based design.
CO3- Apply process/thread management and synchronization techniques in QNX.
CO4- Implement inter-process communication methods for real-time systems.
CO5- Analyze and develop hardware programming concepts, including interrupt handling and memory access

B.Tech-ECE IV-Year-II-Semester **L/T/P C**

2/1/0 3

A58018 Green Technologies

Course Objectives:

- familiarize with the terminology of solar radiation and solar energy collection techniques
- know the different methods of solar energy storage and types of wind mills
- study the principles of bio-conversion, methods of harnessing Geothermal and Ocean energy
- study the benefits of green systems and improved processes over current systems and processes
- acquaint with features and benefits of green buildings

Unit-I: Introduction:

SOLAR RADIATION: Role and potential of new and renewable sources – The solar energy option – Environmental impact of solar power – Structure of the sun – The solar constant – Extraterrestrial and terrestrial solar radiation – Solar radiation on titled surface – Instruments for measuring solar radiation and sun shine, solar radiation data – Photo voltaic energy conversion – types of PV cells

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation – Advanced collectors

Unit-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods – Sensible heat, latent heat and stratified storage, solar ponds – solar applications: solar heating/cooling technique, solar distillation and drying, solar cookers – Central power tower concept and solar chimney

WIND ENERGY: Sources and potentials – Horizontal and vertical axis windmills – Types of winds – Wind data measurement

Unit-III:BIO-MASS: Principles of bioconversion – Anaerobic/aerobic digestion – Types of biogas digesters – Gas yield – Combustion characteristics of biogas – Utilization for cooking, bio fuels – Economic aspects

GEOTHERMAL ENERGY: Resources – Types of wells – Methods of harnessing the energy – potential in India

OCEAN ENERGY: OTEC – Principles of utilization – Setting of OTEC plants – Thermodynamic cycles – Tidal and wave energy: Potential and conversion techniques – Mini-hydel power plants and their economics

Unit-IV: ENERGY EFFICIENT SYSTEMS AND PROCESSES:

SYSTEMS: Fuel cells – Principle, thermodynamic aspects – Selection of fuels & working of

various types of fuel cells – Environmental friendly and Energy efficient compressors and pumps

PROCESSES: Environmental impact of the current manufacturing practices and systems – Benefits of green manufacturing systems – Selection of recyclable and environment friendly materials in manufacturing – Design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing

Unit-V: SUSTAINABLE MATERIALS FOR BUILDINGS: Definition – Features and benefits – Sustainable site selection and planning of buildings for maximum comfort – Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings – Energy management

Text books:

1. Sukhatme S.P. and J.K.Nayak,"*Solar Energy – Principles of Thermal Collection and Storage*", TMH
2. Khan B.H,*"Non-Conventional Energy Resources"*,Tata McGraw Hill, New Delhi, 2006
3. J. Paulo Davim, "*Green Manufacturing Processes and Systems"*, Springer 2013.

References:

1. K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao,*" Alternative Building Materials and Technologies* ,New age international
2. D.Yogi Goswami, Frank Krieth & John F Kreider*," Principles of Solar Engineering",* Taylor & Francis
3. G.D Roy,*"Non-conventional Energy Source",*Standard Publishers.
4. Gregor Hoogers,*"Fuel Cell Technology –Hand Book ",* BSP Books Pvt. Ltd.

Course Outcomes:

After completing the course, students will be able to:

- understand the basic concepts of solar radiation, measurement and its collection
- identify the different solar energy storage techniques and its applications and methods of taping wind energy
- know the biogas production methods, its applications as fuel, the potential of geothermal and ocean energy in India and methods to tap those energies
- understand the environmental impact by the current systems and manufacturing processes and benefits of green systems and improved processes
- discover various building materials, their features and benefits in the context of green buildings