VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. II YEAR
(ELECTRONICS AND COMMUNICATION ENGINEERING)

III SEMESTER **A19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
A19BS1MT08	Complex Analysis and Special Functions	3	0	0	3	3
A19PC1EC01	Probability Theory and Stochastic Processes	3	1	0	4	4
A19PC1EC02	Electronic Devices and Circuits	3	0	0	3	3
A19PC1EC03	Digital System Design	3	0	0	3	3
A19PC1EC04	Signals and Systems	3	0	0	3	3
A19PC2EC01	Electronic Devices and Circuits Laboratory	0	0	3	3	1.5
A19PC2EC02	Basic Simulation Laboratory	0	0	2	2	1
A19PC2EC03	Digital System Design Laboratory	0	0	3	3	1.5
Total		**15**	**1**	**8**	**24**	**20**
A19MN6HS03	Gender Sensitization	0	0	2	2	0

IV SEMESTER **A19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
A19PC1EE05	Control Systems	3	0	0	3	3
A19PC1EC05	Analog and Digital Communications	3	0	0	3	3
A19PC1EC06	Analog Circuits	3	0	0	3	3
A19PC1IT03	Computer Organisation	3	0	0	3	3
A19PC1EC07	EM Waves and Transmission Lines	3	1	0	4	4
A19PC2EC04	Analog and Digital Communication Laboratory	0	0	3	3	1.5
A19PC2EC05	Analog Circuits Laboratory	0	0	3	3	1.5
A19PC2IT02	Python Programming Laboratory	0	0	2	2	1
Total		**15**	**1**	**8**	**24**	**20**

L – Lecture T – Tutorial P – Practical D – Drawing

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	3	0	3

(A19BS1MT08) COMPLEX ANALYSIS AND SPECIAL FUNCTIONS
(Common to ECE & EIE)

COURRSE PRE-REQUISITES: Integral and Differential Calculus

COURSE OBJECTIVES:

- To learn analytic function and their properties
- To learn concept of complex integration
- To learn classifications of Singular points and residues
- To learn the notion of Conformal mapping
- To learn the ways of finding the solutions of Bessel and Legendre equations

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply Cauchy-Riemann equations to study analyticity of functions
CO-2: Evaluate contour integrals using Cauchy's integral theorems
CO-3: Evaluate contour integrals using residue theorem
CO-4: Analyze the image of the given curve under the given transformation
CO-5: Solve ordinary differential equations using the notion of Bessel's equations

UNIT – I:
Functions of Complex Variables: Functions of a complex variable, Continuity, Differentiability, Analyticity, Singular point, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic and conjugate harmonic functions, Milne – Thompson method. Analyticity of Exponential, trigonometric, hyperbolic functions and their properties.

UNIT – II:
Integration of Complex Function, Power Series: Line integral, evaluation along a path and by indefinite integration. Cauchy's integral theorem, Cauchy's integral formula. Expansion of Taylor's series and Laurent series (without proofs).

UNIT – III:
Residues and Real Integrals: Classifications of singular points: Isolated singular point, removable, pole of order m, essential singularity. Residues – Evaluation of residue by formulae, Residue theorem, Evaluation of real integrals (applications).

UNIT – IV:
Conformal Mapping: Definition of Conformal mapping, transformation of e z , log(z), z2 , Sin z, cos z, z + a/z. Basic transformations-Translation, rotation, inversion. Bilinear transformation - fixed point, cross ratio, properties, invariance of circles, determination of bilinear transformation mapping three given points to three assigned points.

UNIT – V:
Special Functions - Bessel Function: Bessel functions, Recurrence relations, properties. Generating function and Orthogonal properties.

UNIT – VI:

Special Functions - Legendre Function: Legendre polynomials, Properties, Rodrigue's formula, Recurrence relations Generating function, and Orthogonal properties.

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, 36th Edition, Khanna Publishers, 2010
2. Higher Engineering Mathematics, B. V. Ramana, 11th Reprint, Tata McGraw Hil, New Delhi, 2010
3. Complex Variables & Its Applications, Churchill and Brown, International Edition, McGraw Hill, 1996

REFERENCES:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley
2. Advanced Engineering Mathematics, Peter 'O' Neil, Cengage Learning

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	3	1	4

(A19PC1EC01) PROBABILITY THEORY AND STOCHASTIC PROCESSES

COURSE PRE-REQUISITES: Calculus for Engineers (19BS1MT01), Linear Algebra and Advanced Calculus (19BS1MT04)

COURSE OBJECTIVES:
- To introduce elementary probability theory as a basis for understanding random signals and random process
- To apply statistical methods on random signals and processes
- To utilize the random signals and systems in communications and signal processing
- To introduce the concepts of internal noise and external noise with reference to a communication system
- To characterize and quantify the channel in terms of coding and capacity

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the fundamentals of probability theory and solve real time probabilistic problems
CO-2: Evaluate and apply the statistical properties on random signals and processes
CO-3: Determine the spectral and temporal characteristics of Random processes
CO-4: Understand the response of linear time Invariant system for a random processes
CO-5: Analyse the noise characteristics of communication channel

UNIT – I:
Overview of Probability Theory: Definitions, scope and history, sets, sample space and events, axioms of probability, discrete, continuous and conditional probabilities, independence, total probability, Baye's rule and applications.
The Random Variable: Introduction, review of probability theory - conditional probability and Baye's theorem, definition of a random variable, conditions for a function to be a random variable, discrete, continuous and mixed random variables, distribution and density functions and its properties, conditional distribution and density and its properties, Binomial, Poisson, Uniform, Gaussian, Exponential and Rayleigh distributions.

UNIT – II:
Operations on Single Random Variable: Expected value of a random variable, function of a random variable, moments about the origin, central moments, variance and skew, characteristic function, moment generating function, Transformations of a random variable: monotonic and non–monotonic transformations for a random variable.

UNIT – III:
Multiple Random Variables: Joint distribution and density functions and its properties, Marginal distribution and density functions, Joint conditional distribution and density, Statistical independence, Sum of two random variables, Sum of several random variables, Central Limit Theorem.

Operations on Multiple Random Variables: Joint moments about the origin, Joint central moments, Joint characteristic functions, Jointly Gaussian random variables: Two random variables case, N-random variables case, properties of Gaussian random variables.

UNIT – IV:
Random Processes–Temporal Characteristics: Concept of random process, Classification of processes, Deterministic and nondeterministic processes, Distribution and density functions, Concept of stationarity and statistical independence, First-order stationary processes, Second-order and Wide-sense stationarity, N^{th}-order and Strict-sense stationarity, Time averages and ergodicity, Autocorrelation function and its properties, Cross-correlation function and its properties, Covariance functions.
Random Signal Response of Linear Systems: System response – convolution, mean and mean-squared value of system response, autocorrelation function of response, Cross-Correlation functions of input and output.

UNIT – V:
Random Processes – Spectral Characteristics: The power density spectrum: Properties, relationship between power density spectrum and Autocorrelation function, Cross-power density spectrum and its properties, Relationship between cross-power density spectrum and cross-correlation function.
Spectral Characteristics of System Response: Power density spectrum of response, Cross power density spectrums of input and output.

UNIT – VI:
Modelling of Noise Sources: Resistive (Thermal) noise source, Arbitrary noise sources, Effective noise temperature, Average noise figure, Average noise figure of cascaded networks.
Introduction to Information Theory: Entropy, Information rate, Source coding: Huffman coding, Shannon-Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law, Trade-off between bandwidth and SNR.

TEXT BOOKS:
1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, 4th Edition, TMH, 2017
2. Modern Digital and Analog Communication Systems, B. P. Lathi, Zhi Ding, 4th Edition, Oxford University Press, 2011

REFERENCES:
1. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis, S. Unnikrishna Pillai, 4th Edition, PHI, 2002
2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, 3rd Edition, Pearson Education, 2013
3. Statistical Theory of Communication, S. P. Eugene Xavier, 1st Edition, New Age International, 1997

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC02) ELECTRONIC DEVICES AND CIRCUITS
(Common to ECE, EIE & EEE)

COURSE PRE-REQUISITES: Engineering Physics (19BS1PH02)

COURSE OBJECTIVES:

- To understand the construction, principle of operation and characteristics of various semiconductor devices
- To study the applications of various semiconductor devices
- To have the familiarity with small signal model of semiconductor devices
- To understand the concepts of feedback in amplifiers and Oscillators

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the principle of operation and substantiate the applications of various Semiconductor devices
CO-2: Appreciate the need for biasing and stabilization
CO-3: Design the application specific circuits using basic active and passive components
CO-4: Explain the necessity of feedback in amplifiers and Oscillators

UNIT – I:
PN-Junction Diode and Applications: Review of p-n Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristics, Ideal and Practical Diode Equivalent Circuits, Transition and Diffusion Capacitances, Breakdown Mechanisms in Semi-Conductor Diodes, Zener Diode and its Characteristics.
Half wave Rectifier, Full wave rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Capacitor filters, π- section filters, Zener diode as Voltage Regulator.

UNIT – II:
Bipolar Junction Transistor, Biasing and Stabilization: Bipolar Junction Transistor (BJT), Transistor Current Components, Transistor Construction, BJT Operation, Common Base, Common Emitter and Common Collector Configurations, Limits of operation, BJT as an Amplifier, BJT Specifications. DC and AC Load lines, Quiescent operating point, Need for Biasing, Analysis of Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector-Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in VBE, β and ICO, Thermal Runaway, Thermal Stability and Compensation Techniques

UNIT – III:
Field Effect Transistor, Biasing: Construction and operation of Junction Field Effect Transistor (JFET), Volt-Ampere characteristics- Drain and Transfer Characteristics, FET as Voltage Variable Resistor, FET Biasing, Construction and operation of MOSFET, MOSFET characteristics in Enhancement and Depletion modes.

UNIT – IV:

Small Signal Low Frequency Amplifiers:

BJT Amplifiers: Small signal low frequency transistor amplifier circuits: h-parameter representation and analysis of single stage CE, CC, CB amplifiers - Computation of Voltage gain, Current gain, Input impedance and Output impedance, Comparison of CB, CE, CC amplifiers.

JFET Amplifiers: JFET Small Signal Model, FET Common Source Amplifier, Common Drain Amplifier.

UNIT – V:

Feedback Amplifiers and Oscillators: Concept of feedback, Types of feedback, general characteristics of negative feedback amplifiers, voltage series, voltage shunt, current series and current shunt feedback configurations and their analysis(BJT version), Illustrative problems.

Classification of oscillators, Conditions for oscillations, RC phase shift oscillator, Generalized analysis of LC oscillators – Hartley and Colpitts oscillators, piezoelectric crystal oscillator, Stability of oscillators.

UNIT – VI:

Special Purpose Semiconductor Devices: Tunnel Diode, Varactor Diode, Photo Diode, Photo Transistor, UJT, LED, SCR

TEXT BOOKS:

1. Electronic Devices and Circuits, J. Millman, C. Halkias, and Satyabrata Jit, 4th Edition, Tata McGraw Hill, 2015
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 11th Edition, Pearson/Prentice Hall, 2016

REFERENCES:

1. Integrated Electronics, J. Millman, C. Halkias, and Chetan D. Parikh, 2nd Edition, Tata McGraw Hill, 2010
2. Electronic Devices and Circuits, T. F. Bogart Jr., J. S. Beasley and G. Rico, 6th Edition, Pearson Education, 2004
3. Microelectronic Circuits, Adel S. Sedra and Kenneth C. Smith, 7th Edition, Oxford, 2014

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC03) DIGITAL SYSTEM DESIGN
(Common to ECE, EEE & EIE)

COURSE PRE-REQUISITES: Linear Algebra and Advanced Calculus (19BS1MT04)

COURSE OBJECTIVES:
- To understand and analyze the logic families
- To understand the different ways of number representation and simplification of Boolean functions with reference to digital circuit design
- To understand the design principles of combinational and sequential circuits
- To understand the role of state machine in digital system designs
- To introduce the principles involved in implementing a digital system using PLDs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify suitable logic family for the implementation of digital ICs
CO-2: Apply the fundamental concepts of digital logic in the design of digital system
CO-3: Analyze and design combinational and sequential logic building blocks of a digital system
CO-4: Apply state machines in the design of digital systems
CO-5: Implement digital systems using various programmable logic devices

UNTI – I:
Digital Logic Families: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing
Number Systems and Codes: Number Systems, Representation of unsigned and Signed Numbers – Binary Arithmetic, Binary Codes, Code Conversions

UNIT – II:
Switching Functions and Logic Simplification: Boolean Algebra postulates and theorems, Algebraic Simplification, Digital logic gates, Multilevel NAND/NOR realizations, Boolean function representations: Canonical and Standard forms, Karnaugh map up to 5 variables, Don't care combinations.

UNIT – III:
Combinational Circuits: Half Adder, Full Adder, Ripple Carry Adder, Half Subtractor, Full Subtractor, Binary Adder/Subtractor, BCD adder, 4-bit Magnitude Comparator, Encoder, Priority Encoder, Decoder, Multiplexer, De- Multiplexer, Barrel shifter.

UNIT – IV:
Sequential Circuits: Classification of sequential circuits, Latches and Flip Flops, SR, JK,D, T and Master-Slave JK Flip Flops, Flip-Flop Conversions, Ripple and Synchronous Counters, Shift Registers, Sequence generator and sequence detector, Introduction to Finite State Machines(Mealy and Moore).

UNIT – V:
Algorithmic State Machine Charts: Introduction to ASM charts, system Design using data path and control subsystems, ASM charts for Binary Multiplier and Dice Game Controller.

UNIT – VI:

Programmable Logic Devices: Logic implementation using Programmable Logic Devices (PLDs): Read Only Memory (ROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Basic architectures of CPLD and FPGA, FPGA Programming Technologies: SRAM, Antifuse, EPROM

TEXT BOOKS:

1. Digital Design, Morris Mano, 3rd Edition, PHI, 2006
2. Modern Digital Electronics, R. P. Jain, 4th Edition, Tata McGraw Hill, 2009
3. Digital Fundamentals, Floyd and Jain, 8th Edition, Pearson Education, 2009

REFERENCES:

1. Digital Systems, Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, 10th Edition, Pearson Education, 2009
2. Digital Principles and Applications, Donald P. Leach, Albert Paul Malvino and Goutam Saha, 8th Edition, McGraw Hill, 2014
3. Fundamentals of Logic Design, Charles H. Roth, Larry L. Kinney, 7th Edition, Cengage, 2015

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC04) SIGNALS AND SYSTEMS
(Common to ECE & EIE)

COURSE PRE-REQUISITES: Calculus for Engineers (19BS1MT01), Linear Algebra and Advanced Calculus (19BS1MT04)

COURSE OBJECTIVES:
- To understand various fundamental characteristics of signals and systems
- To study the importance of transform domain
- To analyze and design various systems
- To study the effects of sampling
- To understand Laplace and Z-transforms their properties for analysis of signals and systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Classify the signals and implement various operations on signals
CO-2: Analyze the spectral characteristics of signals and systems
CO-3: Understand the conditions for physical realizability of a system
CO-4: Identify the significance of sampling types and applications of correlation functions
CO-5: Discover the significance of LT, ZT and their relation

UNIT – I:
Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

UNIT – II:
Signal Analysis: Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions.
Fourier Series Representation of Periodic Signals: Dirichlet conditions, Representation of Continuous time periodic signals using Trigonometric and Exponential Fourier series, Complex Fourier spectrum, Gibb's Phenomenon.

UNIT – III:
Fourier Transform: Fourier transform from Fourier series, Fourier transform of standard signals and periodic signals, properties of Fourier transform with proof, Inverse Fourier Transform.
Laplace Transform: Concept of Region Of Convergence (ROC) for Laplace transform, Properties of ROC, Inverse Laplace Transform, Relation between Laplace Transform and Fourier transform of a signal. Introduction to Hilbert Transform and its properties.

UNIT – IV:

Signal Transmission through Linear Systems: Classification of Continuous time and discrete time Systems, impulse response, Response of a linear system, Transfer function and Filter characteristics of an LTI system, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley -Wiener criterion for physical realization.

UNIT – V:

Convolution and Correlation of Signals: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Properties of Convolution, Concepts of correlation, properties of correlation. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation.

Sampling Theorem: Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals.

UNIT – VI:

Z –Transform: Basic principles of z-transform, region of convergence, properties of ROC, Properties of z-transform with proofs, Poles and Zeros. Inverse z-transform – Power series method, Residue Theorem method, Convolution Method and Partial fraction expansion method.

TEXT BOOKS:

1. Signals, Systems and Communications, B. P. Lathi, BS Publications, 2009
2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI ,1997

REFERENCES:

1. Signals and Systems, A. Anand Kumar, 2nd Edition, PHI, 2012
2. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley, 1998

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	0	3	1.5

(A19PC2EC01) ELECTRONIC DEVICES AND CIRCUITS LABORATORY
(Common to ECE & EEE)

COURSE PRE-REQUISITES: Engineering Physics (19BS1PH02)

COURSE OBJECTIVES:
- To identify various active and passive components
- To understand the functionality of various measuring instruments
- To know the characteristics of various active devices
- To verify the applications of semiconductor devices and circuits

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the specifications of various devices and measuring equipment
CO-2: Analyze the characteristics of various semiconductor devices
CO-3: Appreciate the effect of feedback on the systems' performance
CO-4: Implement the applications using electronic devices

Part A: (Only for viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):
1. Identification, Specification, testing of R,L,C components (color codes),Potentiometer (SPDT, DPDT and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB.
2. Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET, MOSFET, Power Transistors, LED, LCD, SCR, and UJT.
3. Study and operation of:
   a) Multimeters (Analog and Digital)
   b) Function Generator
   c) Regulated Power Supplies
   d) CRO

Part B:
1. V-I characteristics of PN junction diode under forward and reverse bias.
2. V-I characteristics of Zener diode and voltage regulator using Zener Diode.
3. Full wave Rectifier without filter and with π filter: Computation of Ripple factor and Regulation efficiency
4. Input and Output characteristics of CE transistor configuration: computation of h-parameters.
5. Input and Output characteristics of CB transistor configuration: computation of h-parameters.
6. Characteristics of FET under CS configuration.
7. Frequency response of CE Amplifier.
8. Frequency response of CS Amplifier.
9. Frequency response of Voltage series feedback amplifier.
10. RC phase shift Oscillator using transistors.
11. Colpitt's Oscillator using transistors.
12. Characteristics of UJT

Experiments over and above curriculum:

1. UJT Relaxation Oscillator.
2. Transistor as a switch

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	0	2	1

(A19PC2EC02) BASIC SIMULATION LABORATORY

COURSE PRE-REQUISITES: Calculus for Engineers (19BS1MT01), Linear Algebra and Advanced Calculus (19BS1MT04)

COURSE OBJECTIVES: Using simulation tool

- To understand the simulation of generation of Various (Continuous/Discrete) signals
- To study various arithmetic operations on signals and various transforms applied for signals
- To understand the characteristics of LTI system and to find its response for various excitations
- To study about the mathematical tools for signal estimation in the presence of noise

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Synthesize the given waveform using standard test signals and sequences and to find the symmetry of the signal
CO-2: Classify the given system based on its characteristics
CO-3: Analyze the effect of various transformations applied on independent and dependent variables of signals
CO-4: Determine the spectral and temporal characteristics of random processes

LIST OF EXPERIMENTS:

The experiments are to be software simulated using suitable software.

1. Basic Operations on Matrices
2. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and random signals.
3. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding. Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal / Sequence and Real and imaginary parts of Signal.
5. Convolution between (i) Signals (ii) Sequences.
6. Auto Correlation and Cross Correlation of (i) Signals (ii) Sequences.
7. Computation of Unit sample, Unit step and sinusoidal responses of the given LTI system and Verifying its Physical realizability and stability properties.
8. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
9. Verification of Gibb's Phenomenon.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Verification of Sampling Theorem.
12. Verifying the applications of Correlation:
    i. Estimating the period of a periodic signal masked by noise
    ii. Removal of Noise from the combination of signal and noise

13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis and PSD, Probability Distribution Function.
14. Checking a Random Process for Stationary in Wide sense.

Experiments over and above the curriculum:

1. Verification of the properties of FS and FT.
2. Verification of Wiener-Khinchine relation.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	0	3	1.5

(A19PC2EC03) DIGITAL SYSTEM DESIGN LABORATORY
(Common to ECE & EEE)

COURSE OBJECTIVES:

- To get familiarity with functionalities of IC's through hardware simulation
- To learn Verilog Hardware Description Language
- To model, and simulate digital circuits using hardware description languages and CAD tools
- To learn writing test-benches for functional verification of the relatively complex digital system

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Verify the functionality of various Digital ICs
CO-2: Apply hardware description languages for designing and functional verification of combinational circuits
CO-3: Design and verify the functionality of sequential circuits using Verilog HDL
CO-4: Design various state machines and applications using Verilog HDL

LIST OF EXPERIMENTS:

A study on Classification and basic information of Integrated Circuits (ICs).

Part-1: To Verify the Functionality of the following 74 Series ICs.

1. 3- 8 Decoder – 74LS138.
2. 8X1 Multiplexer– 74151 and 2X4 De-multiplexer- 74155.
3. 4-bit COMPARATOR -74LS85.
4. D-Flip- Flop – (74LS74) and JK Master-Slave Flip- Flop (74LS73).
5. Decade Counter (74LS90) and UP-DOWN Counter (74LS192).
6. Universal Shift registers – 74LS194/195.

Part-2: Design and simulate the following Circuits:

1. Logic Gates.
2. Adders and Subtractors
3. Code converters
4. Multiplexer and De-multiplexer.
5. Encoder and Decoder.
6. Parity generator and checker
7. Flip Flops using Truth table and FSM
8. Shift Registers
9. Synchronous & Asynchronous counters
10. Sequence Detector.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	L	T/P/D	C
	0	2	0

(A19MN6HS03) GENDER SENSITIZATION

COURSE DESCRIPTION:
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features a number of exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development

ACTIVITIES:
Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

COURSE OBJECTIVES:
- To sensitize students on issues of gender in contemporary India
- To provide a critical perspective on the socialization of men and women
- To expose the students to debates on the politics and economics of work
- To enable students to reflect critically on gender violence
- To expose students to more egalitarian interactions between men and women

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand important issues related to gender in contemporary India
CO-2: Attain a finer grasp of how gender discrimination works in our society and how to counter it
CO-3: Acquire insight into the gendered division of labour and its relation to politics and economics
CO-4: Respond to put an end to gender violence
CO-5: Equipped to work with the other gender treating them as equals

MODULE 1: Introduction to Gender
- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

MODULE 2: Gender Roles and Relations
- Types of Gender Roles

- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

MODULE 3: Gender Development Issues
- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

MODULE 4: Gender-based Violence
- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

MODULE 5: Gender and Culture
- Gender and Film
- Gender and Electronic Media
- Gender and Advertisement
- Gender and Popular Literature

MODULE 6: Gender and Studies
- Knowledge: Through the Lens of Gender Point of View, Gender and the Structure of Knowledge
- Whose History: Questions for Historians and Others, Reclaiming a Past, Writing Other Histories

TEXT BOOK:
1. "Towards a World of Equals: A Bilingual Textbook on Gender", A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, Telugu Akademi, Telangana Government, 2015

REFERENCES:

1. "More than One Million Women are Missing", Sen, Amartya, 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
2. "By the Numbers: Where Indian Women Work" Women's Studies Journal (14 November 2012), Tripti Lahiri, Available online at: http: // blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-India-women-work/&gt
3. "I Fought For My Life ...and Won ", Abdulali Sohaila, Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal
4. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India, K. Kapadia, London: Zed Books, 2002
5. Just Development: Beyond Adjustment with a Human Face, T. Banuri and M. Mahmood, Karachi: Oxford University Press, 1997

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EE05) CONTROL SYSTEMS
(Common to ECE and EIE)

COURSE PRE-REQUISITES: Ordinary Differential Equations and Laplace Transform

COURSE OBJECTIVES:

- To understand the different ways of system representations-Transfer function representation, state space representation and to assess the system's dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the system's steady state and transient performance
CO-2: Evaluate the effects of feedback on system performance
CO-3: Obtain the transfer function/ state space models
CO-4: Design suitable controller and compensator for the improvement of system performance

UNIT – I:
Introduction to Control Problem: Open-Loop and Closed-loop systems, benefits of Feedback. Mathematical models of physical systems. Transfer function models of linear time-invariant systems –RLC Circuits, DC and AC servo motors. Block diagram algebra and Signal Flow Graphs.

UNIT- II:
Time Response Analysis: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorems. Design specifications for second-order systems based on the time-response.

UNIT – III:
Stability and Root Locus: Concept of Stability, Routh-Hurwitz Criterion, Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT – IV:
Frequency-Response Analysis: Relationship between time and frequency response. Bode plots- transfer function from bode plot-phase and gain margins- stability analysis. Polar and Nyquist plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margins.

UNIT – V:
Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.

Root-loci method of feedback controller design- Application of Proportional, Integral and Derivative Controllers. Design specifications in frequency- domain. Frequency-domain methods of design- Lead and Lag compensators.

UNIT – VI:

State Space Analysis: Concepts of state variables. State space model - RLC circuits and DC motors. State Transition Matrix and its properties- Transformations: State space to Transfer function and vice versa. Eigenvalues and Stability Analysis. Concept of controllability and observability.

TEXT BOOKS:

1. Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International, 2009
2. Modern Control Engineering, K. Ogata, Prentice Hall, 1991

REFERENCES:

1. Modern Control Systems, Richard C. Dorf and Robert H. Bishop
2. Automatic Control System, B. C. Kuo, Prentice Hall, 1995
3. Control Systems: Principles and Design, M. Gopal, McGraw Hill Education, 1997

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1EC05) ANALOG AND DIGITAL COMMUNICATIONS

COURSE PRE-REQUISITES: Signals and Systems(19PC1EC04), Probability Theory and Stochastic Process (19PC1EC01)

COURSE OBJECTIVES:
- To understand the principles of various Analog and Digital modulation and demodulation Techniques
- To analyze the noise performance of Analog Modulation systems
- To Understand the concepts of Pulse Analog and digital modulation
- To Study the concepts of base band transmission
- To understand the principle of Uncertainty of an event and relating it to a communication system

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Appreciate the difference between Analog and Digital communication systems
CO-2: Differentiate and explain about baseband Transmission and pass band transmission of information
CO-3: Understand the effect of filter characteristics of a communication channel on the transmitted signal
CO-4: Analyze and compare various Modulation schemes with reference to their Noise performance
CO-5: Explain the practical significance of codes in communication

UNIT – I:
Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain representation, single tone modulation, power relations in AM waves, Generation of AM waves – Square-Law modulator, Switching modulator, Detection of AM Waves – Square-Law Demodulator, Envelope detector, DSB-SC modulation - time and frequency domain representation, Generation of DSB-SC Waves - Balanced Modulators, Coherent detection of DSB-SC Waves, COSTAS Loop.
SSB Modulation: Time and frequency domain representation, Generation of SSB waves - Frequency discrimination and Phase discrimination methods, Demodulation of SSB Waves, Vestigial side band modulation – Time and frequency domain representation, Noise in AM, DSB and SSB Systems.

UNIT – II:
Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Power in NBFM and WBFM, Transmission bandwidth of FM Wave. Generation of FM Waves - Armstrong Method, Detection of FM Waves - Balanced slope detector, Phase locked loop, Comparison of FM and AM.
Noise in Angle Modulation System, Threshold effect in Angle Modulation System. Pre-emphasis and De-emphasis.

UNIT – III:

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison with AM Receiver.

Pulse Modulation: Types of Pulse modulation – Generation and Detection of PAM, PWM and PPM.

UNIT – IV:

Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise Power, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in DM, Comparison of FDM and TDM.

Various Line Coding Formats: Unipolar, Polar, Bi-polar, Power Spectral Density of various line coding formats, Inter Symbol Interference, Nyquist Criterion to reduce ISI.

UNIT – V:

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK-Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Differential PSK, Principles of QPSK and QAM.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Matched filter, Coherent Reception. Probability error of ASK, FSK, PSK.

UNIT – VI:

Error Correcting Codes:

Linear Block Codes: Linear Codes, Decoding, Constructing Hamming Codes.

Cyclic Codes: Systematic Cyclic Codes, Generator Polynomial and Generator Matrix of Cyclic codes, Cyclic code generation, Decoding, Cyclic Redundancy Check (CRC) codes for Error Detection.

TEXT BOOKS:

1. Principles of Communication Systems, H. Taub, D. L. Schilling, Goutham Saha, McGraw Hill, 4th Edition, 2013
2. Modern Digital and Analog Communication Systems, B. P. Lathi, Zhi Ding, Oxford University Press, 4th Edition, 2011

REFERENCES:

1. Communication Systems, Simon Haykin, Michael Moher, Wiley, 4th Edition, 2009
2. Digital and Analog Communication Systems, K. Sam Shanmugam, Wiley Student Edition, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester	L	T/P/D	C
	3	0	3

(A19PC1EC06) ANALOG CIRCUITS
(Common to ECE & EEE)

COURSE PRE-REQUISITES: Electronic Devices and Circuits (19PC1EC02)

COURSE OBJECTIVES:
- To understand the principle of Multi stage Amplification
- To understand the principle of large signal amplification
- To learn about process of wave shaping circuit
- To study the applications of Operational Amplifier
- To study the IC versions of various waveform generators

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze and Compute the parameters of single and multistage Amplifiers
CO-2: Design various large signal and tuned amplifiers
CO-3: Design the wave shaping circuit for a specified output
CO-4: Understand the characteristics of an Operational Amplifier
CO-5: Design various applications using linear integrated circuits

UNIT – I:
Frequency Response of BJT Amplifiers: Analysis at low and high frequencies, Effect of coupling and bypass capacitors, Miller's Theorem.
Transistor at High Frequency: Hybrid-π Common Emitter transistor model, CE short circuit gain, CE current gain with resistive load, Single stage CE transistor amplifier response at high frequencies.

UNIT – II:
Multistage Amplifiers: Introduction, Methods of inter-stage coupling, Frequency response and Analysis of multistage amplifiers, n-stage cascaded amplifier, CE-CC Amplifier, Darlington Pair.
MOS Amplifiers: MOS Small signal Model, Common source amplifier with Resistive load, Diode connected load, and current source load, Source follower, Cascode Amplifiers.

UNIT – III:
Large Signal Amplifiers: Class-A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Cross Over Distortion, Principle of operation of Class AB and Class C Amplifiers.
Tuned Amplifiers: Classification, Single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

UNIT – IV:
Linear Wave Shaping: High pass, Low pass RC circuits and their response for sinusoidal, step, pulse, square inputs. RC network as a differentiator and integrator, Attenuators.

Non-Linear Wave Shaping: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, Clamping operation, clamping circuits, Clamping circuit theorem.

UNIT – V:

Linear Integrated Circuits: Classification, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp DC and AC characteristics, modes of operation-inverting, non-inverting, and differential.

OP-AMP Applications: Basic applications of Op-amp, Instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample and Hold circuits, Differentiators, Integrators, Comparators.

UNIT – VI:

Data Converters and Waveform Generators: D-A and A- D Converters: weighted resistor DAC, R-2R ladder DAC, Different types of ADCs- Successive approximation ADC and Dual slope ADC, Parallel comparator.

555 Timer and PLL: Introduction to 555 timer, functional diagram, Mono-stable, Astable and Schmitt Trigger operations, PLL – operation and application.

TEXT BOOKS:

1. Integrated Electronics, J. Millman, C. Halkias, and Chetan D. Parikh, Tata McGraw Hill, 2nd Edition, 2017
2. Pulse, Digital and Switching Waveforms, J. Millman ,H. Taub and Suryaprakash Rao M, 3rd Edition, McGraw-Hill, 2017
3. Op-Amps and Linear Integrated Circuits, Ramakanth A. Gayakwad, 4th Edition, PHI, 2015

REFERENCES:

1. Electronic Circuit Analysis, S. Salivahanan, N. Suresh Kumar, Tata McGraw-Hill Education, 4th Edition, 2017
2. Pulse and Digital Circuits, K. Venkata Rao, K. Rama Sudha, G. Manmadha Rao, Pearson Education India, 1st Edition, 2010
3. Linear Integrated Circuits, D. Roy Choudhary, Shail B. Jain, New Age International, 5th Edition, 2018

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B.Tech. IV Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(A19PC1IT03) COMPUTER ORGANIZATION
(Common to ECE, CSE & IT)

COURSE OBJECTIVES:

- To describe the functional blocks of a computer to interpret the instructions and various addressing modes for the execution of instruction cycle
- To perform Arithmetic micro operations on integers and floating-point numbers
- To analyze the cost performance and design trade-offs in designing and constructing a computer processor including memory
- To discuss the different ways of communicating with I/O devices & interfaces and the design techniques to enhance the performance using pipelining, parallelism

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Interpret the functional architecture of computing systems
CO-2: Explore memory, control and I/O functions
CO-3: Impart the knowledge on micro programming
CO-4: Analyze instruction level parallelism, Concepts of advanced pipeline techniques

UNIT – I:
Functional Blocks of a Computer: CPU, memory, input-output subsystem, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
Case study – Instruction set of some common CPUs

UNIT – II:
Data Representation: Signed number representation, fixed and floating point representations, character representation.
Computer Arithmetic: Integer Addition and Subtraction - Ripple carry adder, carry look- ahead adder. Multiplication – Shift-and add, Booth multiplier, carry save multiplier. Division – Restoring and non-restoring techniques, floating point arithmetic.

UNIT – III:
Microprogrammed Control: Control memory, address sequencing, micro program example, and design of control unit, hardwired control, and micro programmed control.

UNIT – IV:
Memory System Design: Semiconductor memory technologies. SRAM vs DRAM.
Memory Organization: Memory interleaving, concepts of hierarchical memory organization, cache memory, cache size vs block size, mapping functions, replacement algorithms, write policies, virtual memory, secondary storage.

UNIT – V:
Peripheral Devices and their Characteristics: Input-output subsystems, I/O device interface, I/O transfers, - program controlled, Interrupt driven and DMA, privileged and non –privileged instructions, software interrupts and exceptions. Programs and

processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB.

UNIT – VI:

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction pipe line, RISC pipeline Vector Processing, Array Processors

TEXT BOOKS:

1. Computer Organization and Design: The Hardware/Software Interfaces, 5th Edition, David A. Patterson and John L. Hennessy, Elsevier
2. Computer Organization and Embedded Systems, 6th Edition, Carl Hamacher, McGraw Hill Higher Education

REFERENCES:

1. Computer System Architecture, M. Morris Mano, 3rd Edition
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, WCB/McGraw-Hill
3. Computer Organization and Architecture: Designing for Performance, William Stallings, 10th Edition, Pearson Education
4. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan, 2nd Edition, Pearson Education

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B.Tech. IV Semester	**L**	**T/P/D**	**C**
	3	**1**	**4**

(A19PC1EC07) EM WAVES AND TRANSMISSION LINES

COURSE PRE-REQUISITES: Engineering Physics (19BS1PH02)

COURSE OBJECTIVES:

- To provide the basic concepts of Electric and Magnetic fields
- To understand the Maxwell's equations and applying boundary conditions to the different material interfaces
- To conceptualize the wave propagation characteristics for different media
- To learn the basic parameters of Transmission lines

COURSE OUTCOMES: After Completion of the course the student is able to
CO-1: Understand the basic concepts of Electric and Magnetic fields
CO-2: Solve equations of EM fields using Maxwell's equations
CO-3: Evaluate and analyze propagation characteristics of electromagnetic waves
CO-4: Find the parameters of transmission lines

UNIT – I:
Electrostatics: Introduction to Vector Calculus and Coordinate Systems, Coulomb's law, Electric filed intensity, fields due to different charge distributions, Electric flux density, Gauss law and applications, Electric potential, Relations between E and V, Maxwell's two equations for electro static fields, energy density, Convection and Conduction currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics , Continuity equation, Relaxation time, Poisson's and Laplace equations, Capacitance –parallel plate, coaxial, spherical capacitors, illustrative problems.

UNIT – II:
Magneto Statics: Biot – Savart's law, Ampere's circuit law and applications, Magnetic flux density, Magnetic scalar and vector potentials, Forces due to Magnetic fields, Amperes Force law, Inductances and Magnetic energy, illustrative problems.

UNIT – III:
Maxwell's Equations: Maxwell's Equations (Time Varying Fields) Faraday's law and Transformer emf, inconsistency of the Amperes law and displacement current density, Maxwell's equations in differential forms, integral forms and word statements, conditions at a boundary surface: Dielectric - Dielectric and Dielectric - conductor interfaces – illustrative problems.

UNIT – IV:
EM Wave Characteristics – I: Wave equations for conducting and perfect dielectric media. Uniform plane waves – definitions, all relations between E and H, sinusoidal variations, wave propagation in loss less and conducting media, conductors and Dielectrics characterization, wave propagation in good conductors and good dielectrics, polarization, illustrative problems.

UNIT – V:

EM Waves Characteristics – II: Reflection and refraction of plane waves – normal and oblique incidences for both perfect conductor and perfect dielectrics, Brewster angle, Critical angle and Total internal reflection, Surface Impedance, skin depth, Poynting vector and Poynting theorem – applications, power loss in a plane conductor, illustrative problems.

UNIT – VI:

Transmission Lines: Types, parameters, Transmission line equations, primary and secondary constants, Expressions for characteristic impedance, propagation constant, phase and group velocities, infinite line concepts, Loss loss/ low loss characterization, Distortion – condition for distortion less and minimum attenuation, Loading, Types of loading. Input impedance relations, SC and OC lines, reflection coefficient, VSWR, UHF lines as circuit elements,
□/4, □/2, □/8 lines - impedance Transformations, Significance of Zmin and Zmax, Smith chart configuration and applications, single and double stub matching, illustrative problems.

TEXT BOOKS:

1. Elements of Electromagnetics, Matthew N. O. Sadiku, 6th Edition, Oxford University Press, 2012
2. Electromagnetic Waves and Radiating Systems, E. C. Jordan and K. G. Balmain, 2nd Edition, PHI, 2000

REFERENCES:

1. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th Edition, TMH, 2006
2. Networks Lines and Fields, John D. Ryder, 2nd Edition, PHI, 1999
3. Engineering Electromagnetics, Nathan Ida, 1st Edition, Springer, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester	**L**	**T/P/D**	**C**
	0	**3**	**1.5**

(A19PC2EC04) ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

COURSE PRE-REQUISITES: Signals and Systems (19PC1EC04)

COURSE OBJECTIVES:

- To introduce the principles of various Analog and Digital Modulation Methods and the study of their spectral characteristics
- To introduce practical implementation of discretization process of a continuous and analog signal
- To understand the principles of channel coding

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Generate AM and FM signals and evaluate their performance
CO-2: Perform signal sampling by determining the sampling rates for baseband signals and reconstruct the signals
CO-3: Generate digital modulation signals and perform their demodulation
CO-4: Encode and decode Linear block codes

LIST OF EXPERIMENTS:

The experiments to be simulated using suitable software.
Minimum 6 experiments are to be implemented in hardware.

1. Amplitude Modulation, Demodulation
2. Frequency Modulation, Demodulation
3. SSB system and synchronous detection
4. Sampling of a continuous and analog signal & Reconstruction
5. Generation & Demodulation of PCM/DM
6. Generation & Demodulation of ASK and FSK
7. Generation and Demodulation of BPSK
8. Generation and Demodulation of DPSK
9. Costa's receiver and AGC system
10. M-ary PSK systems
11. Computation of a channel capacity of binary channels
12. BER comparison of different modulation schemes in AWGN channel

Experiments over and above the curriculum:

Simulation of

i. Modulation and Demodulation of Analog QAM
ii. Encoding and Decoding of Linear Block codes.

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B.Tech. IV Semester	**L**	**T/P/D**	**C**
	0	**3**	**1.5**

(A19PC2EC05) ANALOG CIRCUITS LABORATORY

COURSE PRE-REQUISITES: Electronic Devices and Circuits (19PC1EC02)

COURSE OBJECTIVES:
- To explain the operation, design and Analysis of multistage amplifiers using BJT
- To understand the operation of power amplifiers and their efficiency
- To understand the operation of wave shaping circuits
- To understand the operation of IC 741 and its applications
- To understand the working principle of 555 timer

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Design and analyze multi-stage amplifier circuits
CO-2: Design Linear and Non-linear Waveshaping circuits
CO-3: Analyze and design application specific circuits using Op.Amp IC 741
CO-4: Design applications using IC 555 Timer

PART – A:

Design and simulation of the following circuits using simulation software and implementation through hardware.
1. Common Emitter Amplifier
2. MOSFET- CS amplifier
3. Two stage RC coupled BJT Amplifier
4. Darlington amplifier.
5. Class B Complementary Symmetry Amplifier.

PART – B:

Implement the following:
1. Linear Waves shaping - RC high pass and low Pass circuits
2. Non-linear wave shaping–Clippers
3. Non-linear wave shaping–Clampers
4. Adder, Subtractor, Comparator, Integrator and Differentiator using IC 741 OP-AMP.
5. Square Wave Generator and Triangular Wave Generator using OP- AMP.
6. R-2R ladder D-A Converter
7. Monostable and Astable Multivibrator.using 555 timer
8. Schmitt Trigger circuits using IC 741 & IC 555.

Experiments over and above the curriculum:
1. Sweep generator
2. Active first order LPF, HPF using OP-AMP

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B.Tech. IV Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(A19PC2IT02) PYTHON PROGRAMMING LABORATORY

COURSE OBJECTIVES:

- To install and run the Python interpreter
- To learn control structures
- To understand Lists, Dictionaries in python
- To handle Strings and Files in Python

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Develop the application specific codes using python
CO-2: Understand Strings, Lists, Tuples and Dictionaries in Python
CO-3: Verify programs using modular approach, file I/O, Python standard library
CO-4: Implement Digital Systems using Python

EXERCISE 1: Basics
Running instructions in Interactive interpreter and a Python Script
Write a program to purposefully raise Indentation Error and correct it

EXERCISE 2: Operations
Write a program to compute GCD of two numbers by taking input from the user
Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

EXERCISE 3: Control Flow
Write a Program for checking whether the given number is even number or not.
Write a program using for loop that loops over a sequence.
Python Program to Print the Fibonacci sequence using while loop
Python program to print all prime numbers in a given interval (use break)

EXERCISE 4: Lists
Find mean, median, mode for the given set of numbers in a list.
Write a program to convert a list and tuple into arrays.
Write a program to find common values between two arrays.

EXERCISE 5: Dictionary
Write a program to count the numbers of characters in the string and store them in a dictionary data structure
Write a program combine_lists into a dictionary.

EXERCISE 6: Strings
Write a program to check whether a string starts with specified characters.
Write a program to check whether a string is palindrome or not

EXERCISE 7: Strings Continued
Python program to split and join a string
Python Program to Sort Words in Alphabetic Order

EXERCISE 8: Files
Write a program to print each line of a file in reverse order.
Write a program to compute the number of characters, words and lines in a file.
Write a program to count frequency of characters in a given file.

EXERCISE 9: Functions
Simple Calculator program by making use of functions
Find the factorial of a number using recursion
Write a function dups to find all duplicates in the list.
Write a function unique to find all the unique elements of a list.

EXERCISE 10: Functions - Problem Solving
Write a function cumulative_ product to compute cumulative product of a list of numbers.
Write a function reverse to print the given list in the reverse order.
Write function to compute GCD, LCM of two numbers

EXERCISE 11: Multi-D Lists
Write a program that defines a matrix and prints
Write a program to perform addition of two square matrices
Write a program to perform multiplication of two square matrices

EXERCISE 12: Modules
Install NumPypackage with pip and explore it.

EXERCISE 13:
Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
Write a program to implement Half Adder, Full Adder, and Parallel Adder

TEXT BOOKS:
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

REFERENCES:
1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W. Chun, Pearson
3. Introduction to Python, Kenneth A. Lambert, Cengage