



**Jawaharlal Nehru Technological
University Anantapur**
(Established by Govt. of A.P., Act. No. 30 of 2008)
Ananthapuramu-515 002 (A.P) India

II year B.Tech
Course Structures and Syllabi
under R19 Regulations

JNTUA Curriculum
Electronics and Communication Engineering B. Tech Course Structure

2nd Year to 4th Years Course Structure

Semester – 3 (Theory - 6, Lab –3)					
S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A54302	Complex Variables and Transforms	BS	3-0-0	3
2.	19A04301	Signals & Systems	PC	3-0-0	3
3.	19A04302T	Electronic Devices and Circuits	PC	3-0-0	3
4.	19A04303	Probability Theory and Stochastic Processes	PC	3-0-0	3
5.	19A04304	Digital Electronics and Logic Design	PC	3-0-0	3
6.	19A02304T	Electrical Technology	ES	3-0-0	3
7.	19A04302P	Electronic Devices and Circuits Lab	PC	0-0-3	1.5
8.	19A04305	Basic Simulation Lab	PC	0-0-2	1
9.	19A02304P	Electrical Technology Lab	ES	0-0-2	1
10.	19A99302	Biology For Engineers	HS	3-0-0	0
Total					21.5

Semester – 4 (Theory - 6, Lab –2)					
S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A04401	Electromagnetic Waves and Transmission lines	PC	3-0-0	3
2.	19A04402T	Electronic Circuits – Analysis and Design	PC	3-0-0	3
3.	19A02404	Control Systems	ES	3-0-0	3
4.	19A04403T	Analog Communications	PC	3-0-0	3
5.	19A05304T	Python Programming	ES	2-1-0	3
6.	19A04404	Computer Architecture and Organization	PC	3-0-0	3
7.	19A04402P	Electronic Circuits – Analysis and Design Lab	PC	0-0-3	1.5
8.	19A04403P	Analog Communications Lab	PC	0-0-3	1.5
9.	19A99301	Environmental Science	BS	3-0-0	0
Total					21

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B.Tech – II-I Sem

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19A54302 COMPLEX VARIABLES AND TRANSFORMS

(Common to ECE & EEE)

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.

Unit-I: Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations ($\sin z$, e^z , $\cos z$, z^2) Mobius transformations (bilinear) and their properties.

Unit Outcomes:

Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions .
- Understand the conformal mappings of complex functions.

Unit-II: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with $f(z)$ not having poles on real axis).

Unit Outcomes:

Students will be able to

- Understand the integration of complex functions.

- Apply Cauchy's integral theorem and Cauchy's integral formula.
- Understand singularities of complex functions.
- Evaluate improper integrals of complex functions using Residue theorem.

Unit-III: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Unit Outcomes:

Students will be able to

- Understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
- Find the Laplace transforms of general functions using its properties.
- Understand Laplace transforms of special functions(Unit step function, Unit Impulse & Periodic).
- Apply Laplace transforms to solve Differential Equations.

Unit-IV: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula- Complex form of Fourier series.

Unit Outcomes:

Students will be able to

- Understand finding Fourier series expression of the given function.
- Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function.
- Expand the given function in Fourier series given in Half range interval.
- Apply Fourier series to establish Identities among Euler coefficients.
- Find Fourier series of wave forms.

Unit-V: Fourier transforms & Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Unit Outcomes:

Students will be able to

- Find Fourier Sine and cosine integrals.
- Understand Fourier transforms.
- Apply properties of Fourier transforms.
- Understand Z transforms.
- Apply properties of Z transforms.
- Apply Z transforms to solve difference equations.

Course Outcomes:

After the completion of course, students will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
- Evaluate the Fourier series expansion of periodic functions.

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, Higher, "Engineering Mathematics", Mc Graw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

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19A04301 SIGNALS AND SYSTEMS

Course Objectives:

- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
- To present Fourier tools through the analogy between vectors and signals.
- To teach concept of sampling and reconstruction of signals.
- To analyze characteristics of linear systems in time and frequency domains.
- To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.

Unit I

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error, Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Unit Outcomes:

- Understand different types of signals and systems. (L1)
- State principles of vector spaces and concept of Orthogonality. (L2)
- Describe continuous time signal and discrete time signal. (L2)
- Analyze the periodic signals by applying Fourier series. (L3)

Unit II

Continuous Time Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Unit Outcomes:

- Identify system properties based on impulse response and Fourier analysis. (L1)
- Analyze the spectral characteristics of signals. (L3)
- Illustrate signal sampling and its reconstruction. (L2)
- Apply Fourier transform to solve problems. (L2)

Unit III

Discrete Time Fourier Transform: Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems, Illustrative Problems.

Unit Outcomes:

- Understand the properties of the discrete-time Fourier transform. (L1)
- Analyse the spectral characteristics of signals using Fourier transform. (L3)
- Evaluate the Fourier transform of Discrete-time signals. (L2)

Unit IV

Signal Transmission Through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

Unit Outcomes:

- Understand the impulse response, transfer characteristics of LTI system and various filters. (L1)
- Analyse filter characteristics and physical realisation of LTI system. (L3)
- Apply the relation between bandwidth and rise time & energy and power spectral densities in various applications. (L2)

Unit V

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.

Z-Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, The inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems.

Unit Outcomes:

- Understand the limitations of Fourier transform and need for Laplace transform and develop. (L1)
- Apply transform techniques to analyse discrete-time signals and systems. (L2)
- Evaluate response of linear systems to known inputs by using Laplace transforms. (L2)
- Analyze the continuous-time and discrete-time signals and systems using Laplace and Z-transforms.(L3)

Course Outcomes:

After completion of the course, student will be able to

CO1:Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques. (L1)

CO2:Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L2)

CO3:Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods. (L3)

CO4: Classify the systems based on their properties and determine the response of them. (L4)

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, 2nd Edition, PHI, 2009.
2. Simon Haykin and Van Veen, “Signals & Systems”, 2nd Edition, Wiley, 2005.

References:

1. BP Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford University Press, 015.
2. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
3. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4th Edition, TMH, 2019.

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19A04302T ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

- To acquire fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To introduce different types of semiconductor devices, viz., diodes and special diodes.
- To explain application of diodes as rectifiers, clippers, clampers and regulators.
- To describe operation and characteristics of Bipolar Junction Transistor & Field Effect Transistor.
- To analyze the various biasing circuits using BJTs & FETs.

Unit I:

Semiconductor Diode: Open circuited PN junction, PN junction as a rectifier, Current components in a PN diode, Diode Equation and its mathematical derivation, Volt-Ampere Characteristics, Energy band diagram of PN diode, Temperature dependence of Volt-Ampere Characteristics, Diode resistance (Static and Dynamic resistance), Transition capacitance, Diffusion capacitance, Step graded junction.

Unit Outcomes:

- Study the characteristics and operation of p-n junction diode. (L1)
- Explain the energy band diagram & effect of temperature on the characteristics of diode. (L2)
- Derive the expression for transition capacitance and diffusion capacitance. (L2)

Unit II:

Special Devices: Avalanche breakdown, V-I Characteristics of Zener diode, Zener breakdown, Principle of operation and characteristics of Tunnel diode with the help of Energy band diagram, Photo diode, LED, PIN diode and Varactor diode, Silicon Controlled Rectifier (SCR) and its V-I characteristics, DIAC, TRIAC, Schottky Barrier diode, solar cell, Uni-Junction Transistor (UJT) and its V-I Characteristics, Problem solving.

Unit Outcomes:

- Study the characteristics operation and applications of Zener diode .(L1)
- Explain V-I Characteristics of Tunnel diode, Photo diode, SCR, UJT and other special diodes. (L2)
- Apply concepts of semiconductor devices and solve problems. (L2).

Unit III:

Diode Applications: Diode as switch, Rectifier – Half wave and Full wave rectifier, Bridge rectifier, Ripple factor, PIV, Filters – Inductor and Capacitor Filter, L-section filter, pi-Filter, Zener as voltage regulator, Clipping and Clamping circuits, Detector, Voltage doubler, Problem solving related to diode applications.

Unit Outcomes:

- Understand the circuit operation involving p-n junction and Zener diodes. (L1)
- Analyze the performance of rectifiers with and without filters. (L3)
- Design half wave and full wave rectifier circuits, clippers, clampers and voltage regulator. (L4)
- Compare the various rectifier circuits in terms of their parameter metrics. (L5)

Unit IV:

Bipolar Junction Transistor (BJT):

Transistor – Structure, current components and their relationship, PNP and NPN transistors- Active mode of operation, symbols and conventions, Transistor equations, Transistor as an amplifier, input and output characteristics of Common Base, Common Emitter and Common collector configurations. DC analyses of Common Base, Common Emitter and Common collector circuits.

BJT Biasing: Load line and modes of operations, operating point, Bias stability, fixed bias, self bias, stabilization against variations in I_{co} , V_{BE} , β , Bias compensation, Thermal runaway, condition for Thermal stability, Problem solving.

Applications: As a switch, as an amplifier.

Unit Outcomes:

- Understand the current components and their relationships in BJT. (L1)
- Explain principle, operation and applications of Bipolar Junction Transistor. (L2)

- Describe input and output Characteristics of Bipolar Junction Transistor. (L2)
- Derive the expression for stability factor of various biasing circuits. (L3)
- Analyse the different configurations (CB,CC,CE).(L3)

Unit V:

Field-Effect Transistors (FET) : Metal Oxide Semiconductor Field-effect Transistor (MOSFET) - structures and V-I characteristics of n-channel Enhancement mode MOSFET, p-channel Enhancement mode MOSFET, n-channel depletion mode MOSFET, p-channel depletion mode MOSFET, symbols and conventions, Complementary MOSFETs (CMOSFETs) - structure, V-I characteristics, symbols and conventions, structure and V-I characteristics of n-channel and p-channel Junction Field Effect Transistors (JFET), Problem solving.

Biasing Circuits Using MOSFETS and JFETS: Different configurations using MOSFETs and JFET, load line and modes of operation, different biasing circuits (self-bias, voltage divider bias) using MOSFETs and JFETs, DC Analysis of n-channel and p-channel MOSFETs (both Enhancement and Depletion modes),DC analysis of n-channel and p-channel JFETs, Problem solving.

Applications: MOSFETs, JFET as switch and small signal amplifier, CMOS as a switch.

Unit Outcomes:

- Understand the current components and their relationships in Field effect transistors (JFET, MOSFETs). (L1)
- Explain principle, operation and applications of Field effect transistors. (L2)
- Describe input and output Characteristics of Field effect transistors. (L2)
- Analyse the different configurations (CS,CG,CD) and biasing circuits.(L3)

Course Outcomes:

After the completion of the course students will able to

CO1: Understand principle, operation, characteristics and applications of Bipolar Junction Transistor and Field Effect Transistor (L1)

CO2: Describe basic operation and characteristics of various semiconductor devices. (L2)

CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency and high frequency models of BJT and FET. (L3)

CO4: Design various biasing circuits for BJT and FET. (L4)

CO5: Compare the performance of various semiconductor devices. (L5)

TEXT BOOKS:

1. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.
2. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.

REFERENCES:

1. Behzad Razavi, "Microelectronics", 2nd edition, Wiley, 2013.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
3. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

Prerequisites: Semiconductor Physics

Emphasis on this terminology: Energy band diagram of Insulators, Semiconductors and Metals, Mobility and Conductivity, Electrons and Holes in Intrinsic semiconductor, Donor and Acceptor impurities, drift and diffusion currents, charge densities and semiconductor. Fermi-Dirac function, Carrier concentrations, Fermi level in an intrinsic semiconductor, Fermi level in a semiconductor having impurities.

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B.Tech – II-I Sem

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19A04303 PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Objectives:

- To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the principles of random signals and random processes.
- To be acquainted with systems involving random signals.
- To gain knowledge of standard distributions that can describe real life phenomena.

Unit I

Probability Introduced Through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.

Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Unit Outcomes:

- Understand the fundamental concepts of probability theory, random variables, and conditional probability. (L1)
- Evaluate the different probability distribution and density functions. (L2)

Unit II

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random

Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions.

Unit Outcomes:

- Apply the knowledge to the sum of random variables, central limit theorem in communication system (L2).
- Evaluate the single and multiple random variable concepts to expectation, variance and moments (L4).

Unit III

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit Outcomes:

- Apply the different operations to multiple random variables (L2).
- Understand the concepts of linear transformation of Gaussian random variables (L1).

Unit IV

Random Processes-Temporal Characteristics: The Random Process Concept, 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-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit Outcomes:

- Understand and analyze continuous and discrete-time random processes (L1).
- Analyze the concepts and its properties of auto correlation, cross correlation functions and power spectral density (L3).

Unit V

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, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Unit Outcomes:

- Describe the theory of stochastic processes to analyze linear systems (L2).
- Apply the knowledge to linear systems; low pass and band pass noise models for random processes (L2).

Course Outcomes:

After completion of the course, student will be able to

CO1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L1)

CO2: Formulate and solve the engineering problems involving random variables and random processes. (L2)

CO3: Analyze various probability density functions of random variables. (L3)

CO4: Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.

REFERENCES:

1. Simon Haykin, "Communication Systems", 3rd Edition, Wiley, 2010.
2. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," 3rd Edition, Oxford, 1999.

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B.Tech – II-I Sem

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19A04304 DIGITAL ELECTRONICS AND LOGIC DESIGN

Course Objectives:

- To teach significance of number systems, conversions, binary codes and functionality of logic gates.
- To discuss different simplification methods for minimizing Boolean functions.
- To impart knowledge on operation, characteristics and various configurations of TTL and CMOS logic families.
- To outline procedures for the analysis and design of combinational and sequential logic circuits.
- To introduce programmable logic devices.

Unit I

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.

Binary codes Classification, Error detection and correction – Parity generators and checkers – Fixed point and floating-point arithmetic.

Boolean Algebra & Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.

Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.

Unit Outcomes:

- Summarize advantages of using different number systems. (L2)
- Explain usefulness of different coding schemes and functionality of logic gates. (L2)
- Apply basic laws and De Morgan's theorems to simplify Boolean expressions. (L3)
- Compare K- Map and Q-M methods of minimizing logic functions. (L5)

Unit II

Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure– Binary Adder-Subtractor, Decimal Adder, Multiplier, Comparator, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers, Illustrative examples.

Sequential Circuits-1: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Unit Outcomes:

- Apply Boolean algebra for describing combinational digital circuits. (L2)
- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc. (L4)
- Design various Combinational logic circuits. (L4)
- Implement logic functions with decoders and multiplexers. (L5)

Unit III

Sequential Circuits-2: Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis using flip flops, Elements of Design style, Top–down design, Algorithmic state Machines (ASM), ASM chart notations.

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Unit Outcomes:

- Describe behaviour of Flip-Flops and Latches.(L2)
- Compare Moore and Mealy machine models.(L5)
- Design synchronous sequential circuits using flip flops and construct digital systems using components such as registers and counters (L4)
- Utilize concepts of state and state transition for analysis and design of sequential circuits (L3)

Unit IV

Memory and Programmable Logic: RAM, Types of Memories, Memory decoding, ROM, Types of ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLDs.

Unit Outcomes:

- Define RAM, ROM, PROM, EPROM and PLDs. (L1)
- Describe functional differences between different types of RAM & ROM. (L2)

- Compare different types of Programmable Logic Devices. (L5)
- Design simple digital systems using PLDs. (L4)

Unit V

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I²L, ECL logic Families.

CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations - Wired Logic, Open drain outputs, Interfacing: TTL to CMOS and CMOS to TTL, Tristate Logic, Characteristics of Digital ICs: Speed, power dissipation, figure of merit, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements.

Unit Outcomes:

- Summarize significance of various TTL , I²L, ECL and CMOS subfamilies. (L2)
- Examine Interface aspects of TTL & CMOS logic families. (L5)
- Explain characteristics of digital ICs such as speed, power dissipation, figure of merit, fan-out, noise immunity etc. (L2)
- Compare bipolar and MOS logic families. (L5)

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. (L1)

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. (L2)

CO3: Design combinational and sequential logic circuits. (L4)

CO4: Compare different types of Programmable logic devices and logic families. (L5)

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition, Pearson Education, 2013.
2. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", 3rd Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education (India Private Limited), 2012.

REFERENCES:

1. Wakerly J.F., “Digital Design: Principles and Practices”, 4th Edition, Pearson India, 2008.
2. Charles H Roth (Jr), Larry L. Kinney, “Fundamentals of Logic Design”, 5th Edition, Cengage Learning India Edition, 2010.
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.

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19A02304T ELECTRICAL TECHNOLOGY

Course Objectives: Student can be able to know

- The constructional features of DC machines, different types of DC machines and their characteristic.
- The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
- The analysis of three phase balanced and unbalanced circuits, Three phase induction motors and their characteristics.
- The constructional feature and operation of synchronous machines.

UNIT- I Dc Generators

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

Unit Outcomes:

- To know about principle of operation of a DC machine working as a generator
- To distinguish between self and separately excited generators and classification
- To know how emf is developed
- To distinguish between critical field resistance and critical speed
- To know about various characteristics of different types of generators

UNIT – II D.C. Motors

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne’s Test.

Unit Outcomes:

- To know about principle of operation of DC machine working as a motor
- To know about torque developed
- To know about how to control speed of DC shunt motor
- To know about necessity of starter
- To know about various load characteristics of various types of DC motors

UNIT-III Single Phase Transformers & Three Phase A.C. Circuits

Introduction - Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation- OC and SC Tests - Predetermination of Efficiency and Regulation. Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

Unit Outcomes:

- To understand the principle of operation of 1- ϕ transformer
- To understand computation and predetermination of regulation of a 1- ϕ transformer
- To know about basics of three phase circuits
- To distinguish between phase voltages, currents, line values and phase values
- To distinguish between balanced and unbalanced three phase circuits and power measurement

UNIT-IV 3-Phase Induction Motors

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics – Losses and efficiency.

Unit Outcomes:

- To know about principle of operation of three phase induction motor
- To distinguish between squirrel cage and slip ring induction motors
- To know about various losses and computation of efficiency of induction motor
- To know about the torque developed by the induction motor

- To understand various characteristics of induction motor

UNIT – V Synchronous Machines

Principle and Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

Unit Outcomes:

- To know about principle of working of alternator
- To distinguish between salient pole and cylindrical rotor machines
- To know about emf equation
- To know about predetermination of regulation of alternator by synchronous impedance method
- To know about principle of operation of synchronous motor

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1: Able to calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.

CO2: Able to conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.

CO3: Able to analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.

CO4: Able to have knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications

TEXT BOOKS:

1. I.J.Nagrath & D.P.Kothari, “Electric Machines”, 7th Edition, Tata Mc Graw Hill, 2005
2. T.K.Nagsarkar and M.S. Sukhija, “ Basic Electrical Engineering”, 3rd Edition, Oxford University Press2017.

REFERENCE BOOKS:

1. B. R. Gupta, “Fundamentals of Electric Machines”, Vandana Singhal, 3rd Edition, New age International Publishers, 2005.
2. S. Kamakashiah, “Electromechanics – III”, overseas publishers Pvt. Ltd.
3. V.K. Mehta and Rohit Mehta, “Principles of Electrical Engineering”, S.Chand Publications, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

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19A04302P ELECTRONIC DEVICES AND CIRCUITS LAB

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.
- To analyze the characteristics of diodes, UJT, BJT, FET, SCR.
- To Model the electronic circuits using tools such as PSPICE/Multisim.

LIST OF EXPERIMENTS:

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode based **voltage regulator** against variations of supply and load. Verify the same from the experiment.
5. Study and draw the **output** and **transfer** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find **Threshold voltage (V_T)**, **g_m** , & **K** from the graphs.
6. Study and draw the **output** and **transfer** characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find **I_{DSS}** , **g_m** , & **V_P** from the graphs.
7. Verification of the input and output characteristics of BJT in **Common Emitter** configuration experimentally and find required **h – parameters** from the graphs.
8. Study and draw the input and output characteristics of BJT in **Common Base** configuration experimentally, and determine required **h – parameters** from the graphs.
9. Verify the Volt Ampere characteristics of SCR experimentally and **determine holding current and break over voltage** from the graph.
10. Study and draw the Volt Ampere characteristics of UJT and determine **η** , **I_P** , **I_V** , **V_P** , & **V_V** from the experiment.
11. Design and analysis of voltage- divider bias/self bias circuit using BJT.

12. Design and analysis of voltage- divider bias/self bias circuit using JFET.
13. Design and analysis of self bias circuit using MOSFET.
14. Design a suitable circuit for switch using CMOSFET/JFET/BJT.

Tools / Equipment Required: Software Tool like Multisim/ Pspice or Equivalent, DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

Note: All the experiments shall be implemented using both Hardware and Software. Student has to perform minimum of any 12 experiments

Course Outcomes:

CO1: Understand the basic characteristics and applications of basic electronic devices. (L1)

CO2: Observe the characteristics of electronic devices by plotting graphs (L2)

CO3: Analyze the Characteristics of UJT, BJT, FET, and SCR (L3).

CO3: Design FET based amplifier circuits/BJT based amplifiers for the given specifications.(L4)

CO4: Simulate all circuits in PSPICE /Multisim. (L5).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

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19A04303 BASIC SIMULATION LAB

Course Objectives:

- To provide practical exposure with generation and simulation of basic signals using standardized tools.
- To teach analysing signals and sequences using Fourier, Laplace and Z-transforms.
- To enable to write programs for signal processing applications.

List of Experiments:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightages- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
13. To plot pole-zero diagram in S-plane/Z-plane of given signal/sequence and verify its stability.

Note: All the experiments are to be simulated using MATLAB or equivalent software.

Course Outcomes:

CO1: Understand the basic concepts of programming in MATLAB and explain use of built-in functions to perform assigned task. (L1)

CO2: Generate signals and sequences, Input signals to the systems to perform various operations (L2)

CO3: Analyze signals using Fourier, Laplace and Z-transforms. (L3)

CO4: Compute Fourier transform of a given signal and plot its magnitude and phase spectrum.(L3)

CO5: Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

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19A02304P ELECTRICAL TECHNOLOGY LAB

Course Objectives:

- To do experiments on DC generators
- To do experiments on DC motors
- To do experiments on 1- ϕ transformer
- To do power measurements in 3- ϕ balanced and unbalanced circuits
- To do tests on 3- ϕ Induction motors
- To do experiment on Alternator
- To do experiment on Synchronous motor

List of Experiments:

1. OCC of a separately excited DC generator
2. Load characteristics of DC shunt generator
3. Load characteristics of DC shunt motor
4. Swinburne's test
5. Speed control of DC shunt motor
6. OC & SC tests on a 1- ϕ transformer
7. Measurement of Active and reactive powers in a 3- ϕ balanced circuit
8. Measurement of 3- ϕ power using two wattmeter method in unbalanced circuit
9. Load test on Squirrel cage Induction motor
10. Load test on Slip ring Induction motor
11. Predetermination of regulation of alternator by Synchronous impedance method
12. V and Inverted V curves of Synchronous motor

Note: Student has to perform at least 10 experiments

Course Outcomes:

- To understand various characteristics of DC generators and DC motors
- To predetermine the efficiency and regulation of a 1- ϕ transformer

- To know power measurement in 3- ϕ circuits
- To understand various characteristics of Induction motors, Synchronous machines

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

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19A99302 BIOLOGY FOR ENGINEERS

Course Objectives: To provide basic understanding about life and life Process. Animal and plant systems. To understand what biomolecules are, their structures and functions. Application of certain biomolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units, i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

Unit I: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L2)
- Understand how organisms are classified. (L3)

Unit II: Introduction to Biomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? their role in living cells, their structure, function and how they are produced. (L1)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L3)

- Understand what is fermentation and its applications of fermentation in industry. (L4)

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes (L1)
- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

Unit V: Application of Biology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.(L1)
- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.

Text books:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications -
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology -- 2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A04401 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Course Objectives:

- To introduce fundamentals of static and time varying electromagnetic fields.
- To teach problem solving in Electromagnetic fields using vector calculus.
- To demonstrate wave concept with the help of Maxwell's equations.
- To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.
- To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.

Unit I

Vector Analysis: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates

Vector Calculus: Differential length area and volume, line surface and volume integrals, del operator, gradient, divergent and curl operations.

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Divergence Theorem, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Unit Outcomes:

- Understand basic laws of static electric field. (L1)
- Derive the Maxwell's equations for electrostatic fields. (L3)
- Solve problems applying laws of electrostatics. (L3)

Unit II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to

Magnetic Fields, Magnetic dipole, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations for time varying fields, Maxwell's Equations in Different Final Forms and Word Statements, Illustrative Problems

Unit Outcomes:

- Understand basic laws of static magnetic field. (L1)
- Derive the Maxwell's equations for magnetic fields. (L3)
- Solve problems applying laws of magneto statics. (L3)
- Derive the Maxwell's equations for electromagnetic fields. (L3)
- Apply the boundary conditions of electromagnetic fields at the interface of different media. (L2)

Unit III

Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Unit Outcomes:

- Understand concept of wave propagation through the Maxwell's equations. (L1)
- Derive wave equations for different media. (L3)
- Explain concept of polarization of electromagnetic wave. (L2)

Unit IV

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, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Unit Outcomes:

- Understand principles of reflections and refraction for different incidences. (L1)
- State concept of power flow using Poynting vector. (L2)

- Calculate Brewster angle, power flow and surface impedance. (L3)

Unit V

Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

Unit Outcomes:

- Understand the principles of transmission lines and concept of smith chart.(L1)
- Derive the input impedance of transmission line.(L3)
- Finding the line parameters through problem solving.(L4)
- Study the applications of different lengths of transmission lines.(L2)

Course Outcomes:

After completion of the course, student will be able to

CO1: Explain basic laws of electromagnetic fields and know the wave concept. (L2)

CO2: Solve problems related to electromagnetic fields. (L3)

CO3: Analyze electric and magnetic fields at the interface of different media. (L3)

CO4: Derive Maxwell's equations for static and time varying fields. (L3)

CO5: Analogy between electric and magnetic fields. (L5)

CO6: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths. (L2)

TEXT BOOKS:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 4th edition. Oxford Univ. Press, 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", 7th edition., TMH, 2006.

REFERENCES:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.
2. John D. Krauss, "Electromagnetics", 4th Edition, McGraw- Hill publication 1999.

3. Electromagnetics, Schaum's outline series, 2nd Edition, Tata McGraw-Hill publications, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A04402T ELECTRONIC CIRCUITS-ANALYSIS AND DESIGN

Course Objectives:

- To design and analyze single and multi stage amplifiers using BJT & FET at low and high frequencies.
- To discuss cascading of single stage amplifiers.
- To explain effect of negative feedback on amplifier characteristics.
- To teach basic principles for analysing RC & LC oscillator circuits.
- To introduce different types of large signal amplifiers and tuned amplifiers.

Unit I

Small Signal Amplifiers Using MOSFETS: Graphical analysis, Load line and small signal parameters, Small signal equivalent circuit, Small signal analysis of Common source, Common drain, Common gate amplifiers, Comparison of the three basic amplifier configurations, Problem solving.

JFET Small Signal Amplifiers: Small signal analysis of common source, common drain, common gate amplifiers, JFET as voltage variable resistor, Problem solving.

BJT Small Signal Models: Bipolar linear amplifier, Graphical and ac equivalent circuit, Small signal hybrid- π equivalent circuit, Hybrid- π equivalent circuit including the early effect, other small signal parameters and equivalent circuits-h-parameters.

Small Signal Analysis: Basic CE amplifier circuit, Circuit with Emitter resistance, ac load line analysis, maximum symmetrical swing, Small signal analysis-input and output impedances, Voltage gain, Current gain of CB, CC amplifiers, Problem solving.

Unit Outcomes:

- Understand the concepts and equivalent circuit models of small signal amplifiers. (L1)
- Analyze low frequency and high frequency models of BJT and FET. (L3)
- Design BJT and FET amplifier circuits.(L4)
- Determine performance parameters of BJT and FET amplifiers. (L2)

Unit II

Frequency Response: Amplifier frequency response-different ranges, short circuit and open circuit time constants, time response, transistor amplifiers with circuit capacitors-coupling capacitor effects, load capacitor effects, Bypass capacitor effects, Problem solving, combined effects of coupling and bypass capacitor, high-frequency response model for BJT and MOSFETs, short circuit current gain, Miller effect and its applications, unity-gain bandwidth in BJT and FET amplifiers, CE and CS circuits, CB and CG circuits, Cascode amplifier analysis, emitter and source follower circuits, high frequency response- design application.

Unit Outcomes:

- Analyze the frequency response of single stage amplifiers using BJT & FET at high and low frequencies. (L3)
- Design of single stage amplifiers using BJT and FET with and without coupling capacitors. (L4)
- Explore the various effects of load , bypass and coupling capacitor on the performance of amplifier circuits.(L5)

Unit III

Differential and Multistage Amplifiers: Differential amplifier, basic BJT differential pair and its qualitative description, DC transfer characteristics, small signal equivalent circuit analysis, CMRR, differential and common mode gains, differential and common mode input impedances. Basic differential FET pair, small signal equivalent circuit analysis, JFET differential amplifier, differential amplifier with active load, MOSFET differential amplifier with active load, two stage RC coupled amplifier, Darlington pair and simple emitter follower output, voltage gain, input and output impedances, simplified BJT operational amplifier circuit, design applications- CMOS differential amplifier.

Unit Outcomes:

- Understand basic concepts and need of Differential and multistage amplifiers. Also various inter-stage coupling in multi-stage amplifiers. (L1)
- Analyze and examine few common two stage transistor amplifier circuits viz., Cascade amplifiers, Cascode amplifiers, Darlington pairs. (L3)
- Design multiple stage amplifier circuits. (L4)

Unit IV

Feedback Amplifiers: General Considerations, Properties of Negative Feedback, Types of Amplifiers, Sense and Return Techniques, Polarity of Feedback, Feedback Topologies, Effect of Nonideal I/O Impedances, Stability in Feedback Systems, Analysis of a feedback Amplifiers - Voltage – Series, Current Series, Current-shunt and Voltage-shunt, Illustrative problems.

Oscillators: General Considerations, LC Oscillators, Phase Shift Oscillator, Wien-Bridge Oscillator, Crystal Oscillators, Illustrative Problems.

Unit Outcomes:

- Understand concept of different feedback topologies. (L1)
- Determine the effect of feedback on amplifier characteristics. (L2)
- Analyse characteristics of various types of feedback configurations (L3)
- Explore working principle of oscillator. Also examine different types of oscillators, RC & LC, with detailed mathematical analysis and illustrations. (L2)

Unit V

Power Amplifiers:

Classes of amplifiers-Operations of Class A, B, AB, C, class-A: Inductively coupled amplifier, transformer-coupled common emitter amplifier, transformer-coupled emitter-follower amplifier, Class-AB Push-pull complementary output stages-class-AB output stage with diode biasing, class-AB biasing using the V_{BE} multiplier, class-AB output stage with input buffer transistors, class –AB output stage utilizing the Darlington configuration, Illustrative Problems.

Tuned Amplifiers: Introduction to tuned amplifiers, Role of Q-Factor, Single-tuned, Double-tuned and Stagger-tuned amplifiers.

Unit Outcomes:

- Know most common classes of power amplifier and their basic characteristics. (L2)
- Understand various distortions of amplifiers and the concept of heat sink.(L1)
- Analyse complementary symmetry topologies. (L3)
- Evaluate conversion efficiency of various topologies. (L4)
- Analyse different types of distortions in power amplifiers. (L3)
- Evaluate the resonant frequency for tuned amplifiers. Analyse characteristics of tuned amplifiers (L5)

Course Outcomes:

- CO1:** Understand the working principle of multistage amplifiers, Feedback amplifiers, power amplifiers, tuned amplifiers, Multivibrator and Time base generators (L1)
- CO2:** Analyse multistage amplifiers, multistage amplifiers, feedback amplifiers, power amplifiers, tuned amplifier and Multivibrators. (L3)
- CO3:** Design multistage amplifiers, feedback amplifiers, oscillators, Multivibrator, power amplifiers and tuned amplifiers for given specification.(L4)
- CO5:** Evaluate efficiency of large signal (power) amplifiers and voltage regulators (L5)

TEXT BOOKS:

1. Donald A Neamen, “Electronic Circuits – Analysis and Design,” 3rd Edition, McGraw Hill (India), 2019.
2. J. Millman, C Chalkias, “Integrated Electronics”, 4th Edition, McGraw Hill Education (India) Private Ltd., 2015.
3. K.Lal Kishore, “Electronic Circuit Analysis”, 2nd Edition, B S Publications, 2008.

REFERENCE BOOKS:

1. Behzad Razavi, “Fundamentals of Micro Electronics”, Wiley, 2010.
2. Millman and Taub, Pulse, “Digital and Switching Waveforms”, 3rd Edition, Tata McGraw-Hill Education, 2011
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th Edition, Pearson/Prentice Hall, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A02404 CONTROL SYSTEMS

Course Objectives:

To make the students learn about:

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function
- Transient and steady state response, time domain specifications and the concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- State space modelling of Control system

UNIT – I CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchronos.

Unit Outcomes:

At the end of the unit, the student will be able to

- Write the differential equations for mechanical and electrical systems
- Obtain the transfer function from block diagrams, servo motors and signal flow graphs

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

Unit Outcomes:

At the end of the unit, the student will be able to

- Analyze the time domain specifications
- Calculate the steady state errors
- Understand about Proportional, Integral and Derivative controllers along with combinations

UNIT – III STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability – Routh’s stability criterion – Stability and conditional stability – limitations of Routh’s stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to $G(s)H(s)$ on the root loci.

Unit Outcomes:

At the end of the unit, the student will be able to

- Analyze the concept of stability in time domain
- Apply the concept of Routh’s stability and Root locus in time domain

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

Unit Outcomes:

At the end of the unit, the student will be able to

- Evaluate the frequency domain specifications from Bode, Polar and Nyquist plots
- Design Compensators for various systems
- Deducing transfer functions from Bode Plots
- Understand difference between Phase and Gain margins

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Unit Outcomes:

At the end of the unit, the student will be able to

- Understand the concept of state space, controllability and observability
- Obtain the transfer function from state space and vice versa
- Understand the state transition method of solving time invariant state equations

Course Outcomes:

After completing the course, the student should be able to:

- CO1** Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis
- CO2** Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.
- CO3** Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
- CO4** Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

TEXT BOOKS:

1. Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall of India Pvt. Ltd., 2010.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 5th edition, New Age International (P) Limited Publishers, 2007.

REFERENCE BOOKS:

1. M.Gopal, "Control Systems Principles & Design", 4th Edition, Mc Graw Hill Education, 2012.
2. B. C. Kuo and Farid Golnaraghi, "Automatic Control Systems", 8th edition, John wiley and sons, 2003.
3. Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, "Feedback and Control Systems", 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, "Control System Design" Pearson, 2000.
5. Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, Feedback "Control of Dynamic Systems", 6th Edition, Pearson, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A04403T ANALOG COMMUNICATIONS

Course Objectives

- To introduce various modulation and demodulation techniques of analog communication system.
- To analyze different parameters of analog communication techniques.
- Know Noise Figure in AM & FM receiver systems.
- Understand Function of various stages of AM, FM transmitters and Know Characteristics of AM & FM receivers.
- Understand the concepts of information theory.

Unit – I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Frequency division multiplexing (FDM), Illustrative Problems.

Unit Outcomes:

- Understand the concepts of Amplitude Modulation and demodulation techniques. (L1)
- Apply the concepts to solve problems in Amplitude modulation Schemes. (L2)
- Analyse frequency spectra of modulated signals used in various amplitude modulation (L3)
- Compare the Performance of different amplitude modulation techniques. (L4)

Unit – II

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation

(NBFM) and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves-Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM Capture Effect, Illustrative Problems.

Unit Outcomes:

- Understand the concepts of Angle modulation and demodulation techniques. (L1)
- Understand importance Pre-emphasis & de-emphasis circuit in FM modulation. (L1)
- Apply the concepts to solve problems in Angle modulation Schemes. (L2)
- Analyse frequency spectra of modulated signals used in various angle modulation (L3)

Unit – III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Unit Outcomes:

- Understand different types of noise and sources that effect the performance of the communication system. [L1]
- Analyse performance of analog communication system in the presence of noise. [L3]
- Compare the performance of communication system by evaluating figure of merit for different schemes of modulation. [L4]

Unit – IV

Analog Pulse Modulation Schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Radio Receiver: Working principle of Super heterodyne AM and FM Receivers along with suitable block diagrams, Sensitivity, Selectivity and fidelity.

Unit Outcomes:

- Understand the concepts of Analog Pulse Modulation and Demodulation techniques. [L1]
- Understand the concepts of AM and FM receivers. [L1]
- Apply the concepts to solve problems in Analog pulse modulation schemes. [L2]
- Analyse the performance of AM and FM receivers.[L3]
- Compare the Performance of different Analog Pulse Modulation techniques.[L4]

Unit – V

Information Theory: Introduction, Information and Entropy, and its properties, source coding Theorem, Data Compaction – Prefix coding, Huffman coding, Discrete Memoryless channels, Mutual Information, and its properties, Channel capacity, Channel coding Theorem, Application to binary symmetric channels, differential entropy and mutual information, Information capacity theorem, implication of information capacity theorem, Rate Distortion, Illustrative problems.

Unit Outcomes:

- Understand the concepts of information theory and different coding techniques.[L1]
- Analyse Binary symmetric channel. [L3]
- Design the channel performance using information theory. [L4]
- Derive equation for Entropy, Mutual information and channel capacity for all types of channels. [L2]

Course Outcomes

After completion of the course, student will be able to

CO1: Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes.

Understand the concepts of information theory with random processes. (L1)

CO2: Apply the concepts to solve problems in analog and pulse modulation schemes. (L2)

CO3: Analysis of analog communication system in the presence of noise. (L3)

CO4: Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in analog communication systems.(L4)

CO5: Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel (L5)

TEXT BOOKS:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," 3rd Edition, Oxford Univ. press, 2006.
2. John Wiley & Sons Simon Haykin, "Communication Systems," 3rd Edition, 2010.
3. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.(edition)

REFERENCES:

1. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5th Edition, McGraw-Hill International Edition, 2010.
2. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", 3rd Edition, Tata McGraw- Hill, 2009.
3. R.E. Ziemer & W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", 5th edition, Jaico Publishing House 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.(edition)

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B.Tech – II-II Sem

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19A05304T PYTHON PROGRAMMING

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Unit Outcomes:

Student should be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Unit Outcomes:

Student should be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

Unit - III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit Outcomes:

Student should be able to

- Use the data structure list.
- Design programs for manipulating strings.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions:

Unit Outcomes:

Student should be able to

- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The __str__ method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Unit Outcomes:

Student should be able to

- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Course Outcomes:

Student should be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

TEXT BOOKS:

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

REFERENCE BOOKS:

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

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B.Tech – II-II Sem

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19A04404 COMPUTER ARCHITECTURE AND ORGANIZATION

Course Objectives:

- To discuss organization and design of a digital computer.
- To explain how to use RTL to represent memory and Arithmetic/ Logic/ Shift operations
- To introduce computer languages, machine, symbolic and assembly levels
- To present organization of central processing unit and concepts of micro-programmed control
- To explain how input-output devices communicate with the other components and methods of data transfer
- To teach different types of addressing modes and memory organization.

Unit I

Data Representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Other Binary Codes

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit

Unit Outcomes:

- Represent various data types found in digital computers in binary form (L2)
- Emphasize representation of numbers employed in arithmetic operations and on binary coding of symbols used in data processing (L5)
- Express micro-operations in symbolic form by using register transfer language (L2)
- Develop composite arithmetic logic shift unit to show hardware design of micro-operations (L3)

Unit II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design and Accumulator Logic.

Programming the Basic Computer: Machine Language, Assembly Language, the Assembler, Program Loops, programming arithmetic and logic operations

Unit Outcomes:

- Describe organization and design of a basic digital computer (L2)
- Illustrate techniques used in assembly language programming (L2)
- Show translation from symbolic code to an equivalent binary program using basic operations of an assembler (L2)

Unit III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

Unit Outcomes:

- Develop execution unit to show general register organization of a typical CPU (L3)
- Explain operation of a memory stack (L2)
- Illustrate various instruction formats together with a variety of addressing modes (L2)
- Discuss characteristics and advantages of reduced instruction set computer(RISC) (L6)

Unit IV

Micro-programmed Control: Control Memory, Address Sequencing, Micro-program example, Design of Control Unit.

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations

Unit Outcomes:

- Develop specific micro-programmed control unit to show how to write microcode for a typical set of instructions (L3)
- Design control unit including the hardware for the micro-program sequencer (L6)
- Show procedures for implementing arithmetic algorithms for addition, subtraction, multiplication and division with digital hardware (L2)
- Discuss algorithms to specify the sequence of micro-operations and control decisions required for implementation (L6)

UNIT V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Unit Outcomes:

- Explain how processor interacts with external peripherals through Interface units (L2)
- Compare different modes of data transfer (L4)
- Illustrate procedures for serial data transmission (L2)
- Describe concept of memory hierarchy composed of cache memory, main memory, and auxiliary memory (L2)
- Explain organization and operation of associative memories (L2)

Course Outcomes:

CO1: Conceptualize basics of organizational and architectural issues of a digital computer (L4)

CO2: Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing (L5)

CO3: Develop low-level programs to perform different basic instructions (L5)

CO4: Evaluate various modes of data transfer between CPU and I/O devices (L5)

CO5: Analyze various issues related to memory hierarchy (L3)

CO6: Design basic computer system using the major components (L4)

TEXT BOOKS:

1. M. Morris Mano, “Computer System Architecture”, 3rd edition, Pearson Education, 2017.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th Edition McGraw Hill,
2. John D. Carpinelli, “Computer Systems Organization and Architecture”, 15th reprint Pearson Education, 2018,
3. William Stallings, “Computer Organization and Architecture: Designing for Performance”, 8th Edition, Pearson

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19A04402P ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Course Objectives:

- To provide a practical exposure for design & analysis of electronic circuits for generation and amplification input signal.
- To learn the frequency response and finding gain, input & output impedance of multistage amplifiers
- To Design negative feedback amplifier circuits and verify the effect of negative feedback on amplifier parameters.
- To understand the application of positive feedback circuits & generation of signals.
- To understand the concept of design and analysis of Power amplifiers and tuned amplifiers
- To construct and analyse voltage regulator circuits.

LIST OF EXPERIMENTS:

1. MOSFET Amplifier
 - a. Design and simulate MOSFET (Depletion mode) amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
 - b. Design common source MOSFET (Enhance mode) amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response
2. JFET Amplifier
 - a. Design and simulate common source FET amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
 - b. Design common source FET amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response
3. Common Emitter Amplifier (Self bias Amplifier)
 - a. Design and simulate a self- bias (Emitter bias) Common Emitter amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
 - b. Design voltage divider based Common Emitter amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response.
4. Design and simulate two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve.

5. Design and simulate Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
6. Design and Simulate CE – CB Cascode amplifier. Determine Gain and Bandwidth from its frequency response curve.
7. Design and simulate voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
8. Design and simulate current shunt feedback for the given specifications. Determine the effect of feedback on the frequency response of a current shunt feedback amplifier.
9. Design and simulate RC Phase shift oscillator and Wien bridge oscillator for the given specification. Determine the frequency of oscillation.
10. Design and simulate Hartley and Colpitts oscillators for the given specifications. Determine the frequency of oscillation.
11. Design and simulate class A power amplifier and find out the efficiency. Plot the output waveforms.
12. Design and simulate class B push-pull amplifier and find out the efficiency. Plot the output waveforms.
13. Design and simulate single tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.
14. Design and simulate double tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.

Note: Design & simulate any 12 experiments with Multisim / PSPICE or equivalent software and verify the results in hardware lab with discrete components.

Course Out Comes

After completion of the course, student will be able to

CO1: Understand Characteristics and frequency response of various amplifiers (L1)

CO2: Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers. (L3)

CO3: Determine the efficiencies of power amplifiers (L2)

CO4: Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies (L4)

CO3: Simulate all the circuits and compare the performance.(L5)

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B.Tech – II-II Sem

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19A04403P ANALOG COMMUNICATIONS LAB

Course Objectives

- To familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Understand all types of analog modulation / demodulation principles.
- Substantiate pulse modulation techniques.
- To design and implement different modulation and demodulation techniques.
- To write and execute programs in MATLAB to implement various modulation techniques.

LIST OF EXPERIMENTS

1. (a) Develop an Amplitude modulation circuit to get modulated signal for various modulation indices. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
(b) Design a suitable demodulated circuit to recover original information signal.
2. Generate a DSB - SC signal using suitable circuit diagram. Extract information bearing signal from DSB-SC signal. Calculate the power of the DSB-SC signal.
3. (a) Develop a Frequency modulation circuit to get modulated signal for various modulation depths. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
(b) Design a suitable demodulated circuit to recover original information signal.
4. (a) Design a Mixer circuit to verify the principle of operation of Mixer experimentally.
(b) Design a Pre-emphasis & de-emphasis circuit and verify its importance experimentally and plot necessary graph.
5. Construct Pulse Amplitude Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
6. Construct Pulse Width Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
7. Construct Pulse Position modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
8. Radio receiver measurements – Sensitivity Selectivity and Fidelity.

9. Simulate AM and FM signals and find power spectrum of each signal. Plot the graphs.
- 10 Simulate PAM and PWM signals and find power spectrum of each signal. Plot the graphs.
11. Generate a complex Gaussian noise (with zero mean unit variance). And pass through an LTI system. Find the power spectrum density of the noise signal available at the output of LTI system.
12. Make use of AM signal from experiment no. 9 add Gaussian noise (with zero mean and unity variance) to the signal. Extract the information bearing signal using suitable system.
13. Simulate Huffman coding.

Equipment & Software Required:

Software:

1. Computer Systems with latest specifications
2. Connected in LAN (Optional)
3. Operating system (Windows XP)
4. Simulations software (MATLAB)

Equipment:

1. Regulated Power Supply (0-30) V
2. CROs (0-20)MHz
3. Function Generators (0-3) MHz
4. RF Signal Generators (0-1000) MHz
5. Multimeters
6. Required Electronic components(active and passive)for the design of experiments from 1 -7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000MHz
9. Spectrum Analyzer

Note: Conduct experiments (9-12) using MATLAB software. Student has to perform minimum twelve Experiments

Course Outcomes:

After the completion of the course students able to

CO1: Understand different analog modulation techniques &Radio receiver characteristics.(L1)

CO2: Analyze different analog modulation techniques. (L3)

CO3: Design and implement different modulation and demodulation techniques.(L4)

CO4: Observe the performance of system by plotting graphs & Measure radio receiver characteristics. (L2)

CO5: Simulate all digital modulation and demodulation techniques. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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19A99301 ENVIRONMENTAL SCIENCE

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

UNIT – I

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit Outcomes

- To know the importance of public awareness
- To know about the various resources

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Course Outcomes:

- To know about various echo systems and their characteristics
- To know about the biodiversity and its conservation

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

Solid Waste Management : Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Course Outcomes:

- To know about the various sources of pollution.
- To know about the various sources of solid waste and preventive measures.
- To know about the different types of disasters and their managerial measures.

UNIT – IV

Social Issues And The Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Course Outcomes:

- To know about the social issues related to environment and their protection acts.
- To know about the various sources of conservation of natural resources.
- To know about the wild life protection and forest conservation acts.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Unit Outcomes:

- To know about the population explosion and family welfare programmes.
- To identify the natural assets and related case studies.

Course Outcomes:

At the end of the course, the student will be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications(India), Pvt. Ltd.

REFERENCES :

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.