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<th>Course Code</th>
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<tr>
<td>ECE 401T</td>
<td>Network Analysis</td>
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<td>ECE 402T</td>
<td>Communication System –I</td>
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<td>ECE 403T</td>
<td>Digital Electronics and Logic Design</td>
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<td>ECE 404T</td>
<td>Electronic Devices &amp; Circuits</td>
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<td>ECE 406T</td>
<td>Electromagnetic Waves</td>
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<td>ECE 407P</td>
<td>Digital Electronics and Logic Design Lab</td>
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<td>ECE 408P</td>
<td>Communication System-I Lab</td>
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<td>ECE 409P</td>
<td>Electronic Devices &amp; Circuit Lab</td>
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<td>ECE-410P</td>
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<td><strong>Total Credits</strong></td>
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Network Analysis
(ECE-401T)

Unit-I
Development of the circuit concept: Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts. Approximate realization of a physical system as a circuit. Conventions for describing networks: Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology

Unit-II
First order differential equation: Differential equations as applied in solving networks. Application of initial conditions, Evaluating initial conditions in networks. Laplace Transformation properties, Solution of Network problems with Laplace transformation, Wave form analysis and synthesis: The unit step, ramp and impulse functions and their Laplace transforms. Initial and final value of $f(t)$ from $f(S)$, Convolution integral, convolution as summation

Unit-III
Network theorems and impedance functions: Complex frequency, transform impedance and transform circuits, series and parallel combinations of elements. Network Functions - poles and zeros: Network functions for one port and two port networks (ladder and general networks). Poles and zeros of network functions. Restriction on pole and zero locations for driving point and transfer functions. Time domain behavior from pole zero plot.

Unit-IV
Two port parameters: Relationship of two port parameters. Admittance, impedance, transmission and hybrid parameters, Relationship between sets, Parallel connection of two port networks, Characteristic impedance of two port network

Unit-V
Filter fundamentals – pass and stop band, filter classification, constant $K$ & $m$ derived filters, behavior of characteristics impedance over pass and stop bands, design of filters

Books Recommended:
1. Network analysis by Van Valkenberg
3. Ryder JD, Networks, Fields and lines
Communication System-I  
(ECE- 402T)

Unit-I  
Evolution, introduction and benefits of communication technology, Classification of signals (deterministic & non-deterministic signals, even & odd signals)  

Unit-II  
Frequency modulation (FM): Basic definition, Frequency modulation index, Carson Bandwidth of FM signal, Narrow band and broad band FM signal. Generation of FM, Detection of FM, pre-emphasis, de-emphasis, FM threshold effect

Unit-III  
Elements of digital communication systems, advantages of digital communication systems, Elements of PCM : Sampling, Quantization and Coding, Quantization error (proof not required), Differential PCM systems(DPCM), Delta modulation, its drawbacks, adaptive delta modulation, comparison of PCM and DM systems. Digital Modulation techniques, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK. Similarity of BFSK and BPSK, Base band signal receiver, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK.

Unit-IV  
Frequency division multiplexing (FDM), Tuned radio frequency receiver, heterodyne receiver, image frequency, Pulse modulation Techniques-Pulse Amplitude modulation (PAM), Pulse Position Modulation (PPM) Pulse Width Modulation (PWM).

Unit-V  
Definition of noise, sources of noise, Noise power, White noise, Band limited white noise, signal to noise ratio, SNR of base band communication system, SSB, DSB/SC, Standard-AM, SNR of FM, Noise figure, Relative performance.

Books Recommended:
1. Electronic Communication system; G. Kennedy
2. Electronic Communication Systems(Fundamentals through advanced), W. Tomassi, Pearson Education
3. Communication System by Simon Haykin
References:
1. Communication system; Analog and Digital, Sanjay Sharma
2. Electronic Communications, Roody- Coolan, PHI
3. Electronic Communication by Louis. E. Frenzel
UNIT-I: Number Systems and Codes
Binary, octal, and hexa- decimal number systems, binary arithmetic, binary code, excess-3 code, gray code, error detection and correction codes. Boolean algebra: Postulates and theorems, logic functions, minimization of Boolean functions using algebraic, Karnaugh map and Quine – McClusky methods, realization using logic gates.

UNIT-II: Combinational Circuits
Introduction to combinational circuits, realization of basic combinational functions like Adder, Subtractor, Encoder/Decoder, Multiplexer, Comparators, delays and hazards in combinational circuits, Code converters – Implementation using MUX and ROM

Unit-III: Sequential Circuits
Flip-Flops: SR, JK, T, D, Master/Slave FF, triggering of FF, Analysis of clocked sequential circuits-their design, state minimization, state assignment, circuit implementation, Registers: shift registers, inter-conversion of shift registers, Counters.

UNIT-IV: Programmable Logic Devices (PLD’s):
Programmable Array Logic, Programmable Logic Array – GAL. RISC, CISC – basic concepts.

UNIT – V: Logic Families
RTL, DCTL, PL, DTL, HTL, TTL, ECL, NMOS and CMOS logic gates, circuit diagram and analysis, characteristics and specifications, tri-state gates, totem-pole configuration.

Books Recommended:
UNIT-I
High frequency hybrid-pi model, analysis and design of transistor amplifier circuits at high frequencies, Multistage Amplifiers, RC coupled, direct, transformer coupled, frequency response, bandwidth, gain bandwidth product, CASCODE amplifier, Darlington pair

UNIT-II
JFET’s: operation and characteristics, models, application as low and high frequency amplifiers, MOSFET types, operation and characteristics, biasing and h-parameter model

UNIT-III
Feedback Basics, negative feedback, effect of negative feedback on the performance of amplifiers e.g., on bandwidth, types of feedback amplifiers, current-shunt, current-series, voltage-shunt and voltage series feedback, analysis of the feedback amplifier circuits

UNIT-IV
Sinusoidal oscillators: basic operation, analysis of general oscillator circuits, Barkhausen criterion, various types of oscillator circuits and their analysis: Hartley, Colpitt’s, Crystal, Phase shift, Wien Bridge, design of practical oscillator circuits.

UNIT-V
Power Amplifiers: classification of power amplifiers, Class A, Class B, Class AB and Class C power amplifiers, analysis and design, power supplies and IC regulators, Multivibrators: bi-stable, mono-stable and Astable Multivibrator circuits and their analysis, Wave form generators, triangular and square wave generators, 555 timer

Books Recommended:
1. Integrated Electronics by Millman & Halkias.
2. Electronic Devices by Robert .L. Boylested & Louis Nashlesky
Control Systems (ECE-405T)

UNIT-I: Introduction to linear control systems
Control Systems- examples and classification; Open Loop and closed loop control systems and their differences; Transfer functions; Block diagram representation of systems; Signal flow graphs - Reduction using Mason’s gain formula; Models of some Industrial Control Devices and Systems.

UNIT-II: Continuous-Time System Response and Stability
Standard test signals; Time domain performance of first and second order control systems-time domain specifications of these systems-steady state and transient response, steady state errors and error constants; The concept of stability, BIBO stability. Relation between characteristic equation roots and BIBO stability, Routh-Hurwitz stability criterion, Relative stability analysis;

UNIT-III: Root Locus and Frequency Response Analysis
The Root locus technique and its Construction Principles; Frequency response and Frequency domain specifications; Bode diagrams - Determination of Stability, Phase Margin and Gain Margin from the Bode Diagrams; Nyquist Methods - Determination of Stability, Phase Margin and Gain Margin from the Nyquist Diagrams

UNIT-IV: Classical Control System Design Methods
Control System Design using Root Locus methods - Relationship between Root Locus and Time Domain – Cascade (Lag, Lead, Lag-Lead, PI, PID) and Feedback (PD) compensation using Root Locus plots; Compensator design using Bode plots - Cascade (Lead, Lag, Lag-Lead, PI, PID) and Feedback (PD) compensation.

UNIT-V: Control system analysis using State Variable methods
Introduction to the State variable representation; Conversion of State variable models to transfer functions and vice-versa; Eigen values and Eigen vectors; Solution of state equations; Properties of state transition matrix- computation of state transition matrix by Laplace transformation and Cayley-Hamilton theorem; Concepts of Controllability and Observability.

Text Books

Reference Books
UNIT-I Electromagnetic theory (Vector Analysis):
Review of scalar and vector fields; vector addition, subtraction and multiplication, co-ordinate systems—Cylindrical co-ordinate and spherical polar co-ordinates, vector representation of surfaces, physical representation of gradient, divergence and curl, gauss divergence theorem, stokes theorem, Dirac-Delta function, tutorial problems.

UNIT-II Electrostatic fields:
Introduction, Coulomb’s law of force, Electric field intensity—Electric field due to a system of charges, field due to sheet of charge, field due to continuous volume charge, electric flux density: Gauss law and its applications; Electrostatic potential; Poisson’s equation and Laplace Equation; capacitors and capacitances; energy associated in electrostatic fields; Dielectrics in static electric field, Boundary conditions for electrostatic fields.

UNIT-III Magneto-static fields:
Introduction, Biot-Savart’s law or (Ampere law for forces); Magnetic flux density, Magnetic field intensity, Ampere Circuital Law, magnetic scalar and vector potential, Inductor, magnetic induction and Faraday’s law, self and mutual Inductance, Steady Electric current, tutorial problems.

UNIT-IV Time-varying fields:
Maxwell’s equations and Boundary conditions; Introduction, equation of continuity for time varying fields, inconsistency of Ampere’s law, Displacement current (Physical interpretation). Time varying field equations, Boundary conditions

UNIT-V Electromagnetic waves:
Introduction, solution of wave equation in free space, wave equation for conducting media, uniform plane wave propagation, wave propagation in lossless and conducting mediums; wave propagation in good conductors, depth of penetration, wave propagation in good dielectrics, wave polarization, reflection and refraction of plane waves at plane Boundary (perfect conductor-normal incidence); poyning vector and pointing theorem.

Books Recommended:
1. Introduction to Electromagnetics by Griffith
2. Theoretical Physics Vol-II by Constant
3. Electromagnetic field and waves by Corson & Lorrain
1. To verify the truth table of the following logic gates:
   - AND, OR, NOT
   - NAND, NOR, XOR, XNOR

2. Realization of:
   - Half Adder and verify its truth table
   - Full Adder and verify its truth table
   - Half subtractor and verify its truth table
   - Full subtractor and verify its truth table

3. To design multiplexer and demultiplexer using 2-input NAND gates.

4. Realization of:
   - Flip-Flops
   - Ripple Counters
Communication System-I Lab
(ECE -408P)

List of Experiments:
1. To realize Amplitude Modulation (AMDSB-FC) & Demodulation
2. To realize Amplitude Modulation (AMDSB-SC) & Demodulation
3. To realize Amplitude Modulation (AMSSB-FC) & Demodulation
4. To realize Frequency Modulation (FM) & Demodulation
5. To realize Pulse Amplitude Modulation (PAM) & Demodulation
6. To realize Pulse Width Modulation (PWM) & Demodulation
7. To realize Pulse Position Modulation (PPM) & Demodulation
8. To realize Pulse Code Modulation (PCM) & Demodulation
9. To realize Frequency Shift Keying Modulation & Demodulation
10. To realize Amplitude Shift Keying Modulation & Demodulation
11. To realize Phase Shift Keying Modulation & Demodulation
List of Experiments:

Lab 1: To plot the Gain-frequency response of CE Amplifier
Lab 2: To plot the Gain-frequency response of a CB amplifier
Lab 3: To plot the gain-frequency response of an Emitter follower Amplifier
Lab 4: To study the gain-frequency response of a cascaded amplifier
Lab 5: To determine $g_{m}$ and $r_{out}$ of a JFET
Lab 6: To plot the I-V characteristics of a BJT and determine $h_{fe}$, $h_{re}$ and $h_{re}$
Lab 7: To plot the $I_E-V_E$ characteristics of a UJT
Lab 8: to study a relaxation oscillator using a UJT
Lab 9: To study the operating characteristics of a Solar Photo-voltaic Cell
Lab 10: To draw the characteristics of a SCR
Control System Lab
(ECE-410P)

List of Experiments:

1. To study the performance of Relay control Combination of P, I and D control schemes in a Temperature control system.
2. To study the torque-speed characteristics of an AC servomotor, determine its parameters and evaluate its transfer function.
3. To study the open loop and closed loop step response of first, second and third order simulated linear systems.
4. To study D.C. motor angular position control system, do step response studies for various values of forward gain.
5. Study the effect of velocity feedback on the transient and steady state performance of D.C. motor speed control system.
6. To study the computer simulation of a number of systems.
7. Use of MATLAB / SIMULINK /Control System tool boxes.