EC-401 - Signals and Systems

UNIT I

Representation of signals and systems : Signals and classification of signals, basic continuous-time signals, basic discrete time signals, sampling theorem, systems and classification of systems, response of a continuous-time LTI system and the convolution integral, properties of continuous-time LTI systems, Eigen functions of continuous-time LTI systems, systems described by differential equations, response of a discrete-time LTI system and convolution sum, properties of discrete-time LTI systems, Eigen functions of discrete-time LTI systems, Transmission of signals through a LTI system.

UNIT II

Fourier Analysis of continuous-time signals and systems :Introduction, Fourier series representation of periodic signals, the Fourier Transform, properties of the continuous-time Fourier Transform, the frequency response of continuous-time LTI systems, filtering, bandwidth.

UNIT III

Fourier analysis of discrete-time signals and systems :Introduction, Discrete Fourier Series, the Fourier Transform, properties of the Fourier Transform, the frequency response of discrete-time LTI systems, system response to Sampled continuous-time sinusoids, the Discrete Fourier Transform.

UNIT IV

The Z-Transform :Introduction, the Z-Transform, Relation between Z-Transform and Fourier Transform-Transforms of some common sequences, properties of the Z-Transform, the inverse Z-Transform, the system function of discrete-time LTI systems, the unilateral Z- Transform .

UNIT V

Discrete Time Random Processes: Random variables –Definitions, ensemble averages, jointly distributed random variables, joint moments, independent, uncorrelated and orthogonal random variables, Gaussian random variables. Random Processes – Ensemble averages,
stationary processes, the auto covariance and autocorrelation matrices, ergodicity, white noise, frequency domain description of random processes, transmission of random signals through a LTI system.

References:

1. Oppenheim AV, Willisky AS and Nawab SH; Signals and systems; Pearson.
2. Proakis JP,.Manolakis; Digital Signal Processing principles…; Pearson.
3. Hwei.P .Hsu; Signals and systems, Schaum`s outlines; TMH.

EC- 402 Computer System Organizations

Unit-I

Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Unit-II

Control Unit Organization: Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming,

Arithmetic and Logic Unit: Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic units, design of arithmetic unit.

Unit-III

Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor. Data transfer – Serial / parallel, synchronous/asynchronous, simplex/half duplex and full duplex.

Unit-IV

Memory organization: Memory Maps, Memory Hierarchy, Cache Memory -Organization and mappings. Associative memory. Virtual memory, Memory Management Hardware.

Unit-V

Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

References:

a) Morris Mano: Computer System Architecture, PHI.
b) William Stallings: Computer Organization and Architecture, PHI
c) Carl Hamacher: Computer Organization, TMH
d) Tanenbaum: Structured Computer Organization, Pearson Education

EC- 403 Electronic Device and Circuit

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, transition and diffusion capacitance, power dissipation.

Unit-II

Diode Family and Applications: Diodes Family: Characteristics and application of p-n junction diode, Zener diode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes, phototransistors, p-n junction. **Applications:** diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Pieceswise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.

Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier. **Transistor at high frequency**, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain.

Unit-IV

Bipolar junction transistor and Oscillators- Construction, basic operation, current components and equations,. CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor (Pdmax rating), Photo transistor, Uni-junction Transistor (UJT) : Principle of operation, characteristics.

Feedback amplifier, negative feedback, voltage series, voltage shunt ,current series and current shunt feedback , Sinusoidal oscillators, LC (Hartley Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, Class A, class B , class A,B,C amplifiers , their efficiency and power Dissipation, Pushpull and complimentary pushpull amplifier.

Unit-IV

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.

Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier. **Transistor at high frequency**, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain.

Unit-V

FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

References:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education

2. Millman and Halkias: Integrated electronics, TMH

3. Graham Bell: Electronic Devices and Circuits, PHI

4. Sendra and Smith: Microelectronics, Oxford Press.

5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)

2. Characteristics of Transistors (BJT and FET)

3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc).

EC-404 Linear Integrated Circuits and its Applications

UNIT-I: Introduction to Operational Amplifiers and Characteristics
Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP- AMP applications, inverting and non-inverting amplifier configurations.

UNIT-II: The Practical op-amp Introduction, Input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain –bandwidth product, frequency limitations and compensations, transient response, interpretation of TL082 datasheet.

UNIT-III: Amplifiers and Oscillators Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, isolation amplifiers, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO.

UNIT-IV: Active Filters
Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, notch filter, All pass filters, self-tuned filters.

UNIT-V: Comparators and Converters:
Comparator, Zero Crossing Detector, Monostable and Astable Multivibrator ,Schmitt Trigger, Voltage limiters, Clipper and clampers, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

UNIT-VI: Advanced applications
Applications as Frequency Divider, PLL, AGC,AVC using op-AMP and analog multipliers, Amplitude modulation using analog multiplier, Frequency Shift Keying, simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210.

List of Experiments

Tools Required –Function Generator, TL082, MPY634/ASLK Pro, Power Supply, Oscilloscopes, Connecting wires.

1. Study the characteristics of negative feedback amplifier
2. Design of an instrumentation amplifier.
3. Study the characteristics of regenerative feedback system with extension to design an astable multivibrator.
4. Study the characteristics of integrator circuit.
5. Design of Analog filters – I.
6. Design of Analog filters – II.
7. Design of a self-tuned Filter.
8. Design of a function generator.
9. Design of a Voltage Controlled Oscillator.
10. Design of a Phase Locked Loop (PLL).
11. Automatic Gain Control (AGC) Automatic Volume Control (AVC).
12. Design of a low drop out regulator.
13. DC-DC Converter.

TEXT Books:

1. D. Roy Chowdhury, " Linear Integrated Circuits", New Age International (P) Ltd, 2nd Edition, 2003.
2. K. Lal Kishore, " Operational Amplifiers and Linear Integrated Circuits", Pearson Education, 2007.
3. L. k. Maheshwari, M M S Anand , Analog Electronics, PHI
4. TL082:Data Sheet:http://www.ti.com/lit/ds/symlink/t1082.pdf Application Note:http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
5. MYP634: Data Sheet:http://www.ti.com/lit/ds/symlink/mpy634.pdf Application Note:http://www.ticom/lit/an/sbfa006/sbfa006.pdf

REFERENCES :

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICS", PHI, 4th edition, 1987.
2. R.F. Coughlin & Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits" , 6th Edition, PHI
3. David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd edition, 2010.
4. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits" Mcgraw Hill, 1988.
5. C.G. Clayton , "Operational Amplifiers " , Butterworth & Company Publ. Ltd./Elsevier, 1971.

EC-405 Analog Communication

Unit-I

Signal Analysis: Vectors and signals, orthogonal functions, Fourier series, Complex Fourier spectrum, Fourier Transform, Time domain and frequency domain representation of a signal, Existence of the FT, FT of some useful functions like exponential signal single sided & double sided, Gate function, singularity functions, FT of various functions, Properties of FT, Convolution, Convolution with Impulse Function. **Signal Energy and Power:** Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train. **Linear Time Invariant (LTI) Systems** Casual and Non Causal System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Radio Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters - Frequency Multiplication Applied to FM Signals, FM transmitters.
Radio Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, ideality and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V

Noise : Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems,

References:

B.P. Lathi : Communication Systems, BS Publication
Taub and Schilling : Principles of communication Systems, TMH
Singh and Sapre : Communication Systems, TMH
S Haykin : Communication Systems, John Wiley and Sons Inc
B.P. Lathi : Signal, Systems and Communication Systems, BS Publication

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be tested on the bread board.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1) Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2) Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3) To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4) Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5) To Construct Frequency Multiplier Circuit and to Observe the Waveform
6) Study of AVC and AFC.
7) Study of PLL chip (566) and its use in various systems

EC-406 Software Lab-II

Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication.

Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).
2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc)
3. Realization of various signals and communication link etc.
4. Students should simulate and verify at least six circuits they are learning in the current semester.