

**SE – EXTC
ELECTRONICS – 2**

1. Frequency Response :

General concepts, decibels, low frequency response characteristic. Gain bandwidth product, high frequency response, frequency response of cascade amplifiers, effect of low frequency and high frequency on coupling and bypass capacitors

2. Multistage amplifiers :

RC coupled transformer coupled, direct coupled, Low frequency and high frequency considerations, cascade amplifier, Darlington pair, their performance. Analysis and design considerations of multistage amplifiers, effect of source and load resistance.

3. Feedback Amplifiers :

Feedback concept, ideal feedback amplifier, classification of feedbacks, Topology, analysis and design of different types of negative feedback, General analysis of multistage feedback and multi feedback amplifiers

4. Large signal amplifiers :

Harmonic Distortion and power efficiency of Class A, B, AB and C amplifiers, Thermal considerations and design selection of heat sinks

5. Oscillators :

Principle of oscillation, RC oscillator, Wein Bridge Oscillator, twin T oscillator, oscillator with LC feedback, Colpitt oscillator, clap oscillator, Armstrong oscillator, Crystal controlled oscillator

6. Operation Amplifiers :

Differential amplifiers – their types, small signal analysis, differential stage, level shifter & other blocks integrated Op-Amp, Study of Op-Amp parameters like open loop / closed loop response, frequency response , positive and negative feedback, stability , slew rate, Op-Amp using MOS, BICMOS, JFET.

7. Applications of Op-amp :

Comparator, adder, subtractor, integrator, differentiator, instrumentation amplifier, log, antilog amplifier

List of Experiments :

1. Frequency response and performance parameters of two stage BJT amplifier
2. Frequency response and performance parameters of two stage FET amplifier
3. Cascade amplifier and finding its parameters
4. Voltage series feedback using BJT ,FET. Its effect on frequency response.
5. Current series feedback using BJT ,FET. Its effect on frequency response.
6. Op-amp in inv / non-inv mode
7. Op-amp as an integrator and differentiator.
8. RC phase shift oscillator for different amplitude and frequencies.
9. Colpitt/ Hartley oscillator
10. Class C amplifier and its efficiency

Addition:

Atleast 2 expts using simulation software

Term work :

Each student has to appear for atleast 1 written test during the term. Report on experiments (atleast six from the given list) along with a graded answer paper shall be submitted as termwork. Report on experiments will further include atleast 2 simulation software making a total of eight experiments.

The distribution of termwork marks will be as follows:

Report on experiments : 15 marks

Written test : 10 marks

Text Books :

Electronic Devices – Floyd, Pearson Education Asia Publication

Microelectronics Circuits Analysis and Design – Rashid, PWS publishing company

Reference Books :

Electronic Devices and circuits theory – Boylested

Microelectronics – Jacob Millman and Arcin Grabel, McGraw Hill publication

Electronic circuit analysis and design – Neamen

SE EXTC – Sem 4

Subject : Electromagnetic wave theory

1. Coulomb's law and electric field intensity

Coulomb's law, electric field intensity, calculation of electric field intensity for various charge distributions, streamlines and sketches of field

2. Electric Flux Density and Gauss' Law

Electric flux density, Gauss' law, application of Gauss' law, vector operator and divergence theorem

3. Energy and Potential

Energy expended in moving a point charge in an electric field, line integral, potential and P.D., calculations of electric field of both point charge and system of charges potential gradient, dipole, energy, density

4. Conductors, Dielectrics, Capacitance

Current and current density, continuity of current, conductor properties, Dielectric material and properties, capacitance, calculation of capacitance of various configurations method of images

5. Poisson and Laplace's equation

Poisson and Laplace's equation and its applications, uniqueness theorem, product solution of Laplace's equation

6. Steady magnetic field

Biot Savart Law, Ampere's circuital law, curl of H, Stoke's theorem, magnetic Flux and flux density, scalar and vector magnetic potentials of steady magnetic field lines

7. Time varying Fields and Maxwell's equations

Faraday's law concept of displacement currents, Maxwell's equations in point form, Maxwell's equations in integral form, boundary conditions and significance of Maxwell's equations

8. Uniform Plane Waves

Uniform plane waves in time domain in free space, sinusoidally time varying uniform plane waves in free space, wave equation and solution for material uniform plane. Waves in dielectrics and conductors, reflections of uniform plane waves, significance of plane waves, polarization of waves

9. Poynting vector and Flow of power

Poynting theorem, power flow for a plane wave, power flow in a concentric cable, Poynting vector about RC lines, heterogenous average and complex Poynting vector, Poynting loss in a plane conductor

Term Work

Each student has to appear for atleast one written test during the term. Atleast 8 assignments covering all the topics of syllabus with a graded answer paper shall be submitted as the term work.

The distribution of term work will be as follows :

Report on expts : 15 marks

Written test : 10 marks

Text Books

Engineering electromagnetics – William H. Hayt, Tata McGraw Hill publication
Elements of engineering electromagnetics – Nannapaneni Narayana Rao, Prentice Hall of India publication
Electromagnetic Waves and Radiating Systems – Edward C.Jordan, Keith G. Balmain

SE EXTC – Sem 4

Subject : P.Com

1. Introduction

Elements in a communication system, modulation and demodulation. Noise in communication systems, signal to noise ratio, noise factor and noise figure, equivalent noise temperature

2. Amplitude Modulation

DSB, Full carrier AM – principles, modulator circuits, transmitters, different types of AM, suppressed carrier AM, SSB, ISB – principles, transmitters

3. Angle modulation

Frequency modulation, phase modulation, effect of noise, FM modulators, transmitters

4. Radio Receivers

Receiver characteristics, TRF and superheterodyne receivers, AM detectors, FM detectors, receiver circuits

5. Analog Pulse Modulation

Sampling theorem for low-pass and band-pass signals – proof with spectrum, aliasing, sampling techniques – principle, generation, demodulation, spectrum. PAM, PWM, PPM – generation and detection.

6. Digital Transmission

Quantization, Quantization error, non-uniform quantizing, encoding. PCM, DPCM, Delta modulation. Adaptive delta modulation – transmission system, bandwidth

7. Multiplexing

Principle of TDM, FDM, multiplexing hierarchies

8. Line codes and their spectra

Text Books :

1. Wayne Tomasi, Electronic communication systems, Pearson Education, 3rd edition
2. Roy Blake, Electronic communication systems, Thomson Asia Pte Ltd.
3. Leon W. Couch, Digital and Analog Communication systems, Pearson Education, 6th edition
4. Herbert Taub and Donald Schilling, Principles of Communication systems, Tata McGraw Hill, 2nd edition

Textbooks 3 & 4 for Digital Transmission and Multiplexing topics only

Term work

The termwork shall consist of atleast 8 expts based on the whole syllabus, duly recorded and graded. This will carry a weightage of 15 marks. A test shall be conducted and will carry a weightage of ten marks.

SE EXTC – Sem 4
Subject : Signals and systems

1. Introduction

Signals, systems, classifications of signals, elementary signals – analog and digital signals, basic operations of signals, classification of systems

2. Time Domain representation for linear time invariant systems (analog and discrete)

Convolution, series and parallel connections of systems, casual, non-casual, memory less, with memory, stable invertible systems, de-convolution, impulse, step and differential equation representation for LTI systems. RC,RLC ckt state variable description.

3. Fourier representation for continuous time and discrete time signals

Representation of signals in terms of orthogonal functions, orthonormal signals, Fourier series, discrete time fourier transform, their properties , Fourier transform representation of periodic signals.

4. Laplace Transforms

Introduction to Laplace transforms, its properties, LT of elementary signals, unilateral LT, inversion of LT, using LT with or without initial conditions, Transfer function of system, state variable description

5. Z – Transform

Intro, Z-transform of elementary signals, ROC, Properties of Z-Transform, Inversion of Z-Transform, system function, solution of difference equation, unilateral Z-transform

6. State Space analysis

State variable model, transfer function from state variable model and vice versa, diagonalisation, equivalent state equations, solution of LTI state equations, Laplace transform method, state equation, discrete time systems, discretion of continuous time state equations

Assignment / Tutorial

1. Elementary signals continuous time and discrete time and basic operations on them
2. Classification of signals and systems – casual / non-casual , TI / LTI , stable / unstable
3. Convolution of continuous time and discrete time sequences
4. LT of sequences using properties
5. Z transform and ROC

6. Solution of difference and differential equations
7. Fourier series of periodic signals
8. Fourier transform of signum function, impulse and aperiodic signals
9. State variable model of a system and its impulse response
10. Unilateral Laplace transforms

Term Work

Each student has to appear for atleast one written test during the term. At least 8 assignments from the suggested list along with a graded answer paper shall be submitted as termwork.

The distribution of term work will be as follows :

Assignments – 15 marks

Written Test – 10 marks

Text Books

Signals and systems – Simon Haykin and Barry van Veen, John Wiley publication

Signals and systems – Oppenheim & Willsky, Prentice Hall of India publication

Reference Books

Signals and systems – I.J.Nagrath , S.N.Sharan, Tata McGraw Hill

Signal processing and linear systems – B.P.Lathi, Oxford publication

Analog and digital signal processing – Ashok Ambardar, Thomson Learning publication

SE EXTC – sem 4

Subject : Wave shaping Techniques

1.Voltage time Base Generators

General features of a time based signal, exponential sweep circuit, sweep circuits using UJT, fixed amplitude sweep, transistor constant current sweep, miller and bootstrap time base generators (transistor based), compensating networks

2. Timer and applications

IC 555 timer, functional block diagram, 555 in Astable and monostable modes, typical applications like ramp generator, missing pulse detector, PWM modulator,, PPM modulator, Schmitt trigger

3. Waveform Generators

Using OP-amps – Schmitt trigger, square and triangular wave generators, VCO, pulse generators, staircase generator, function generator ICs – 566, 8038, XR2206

4. Voltage regulators

IC 723 – Functional block diagram, design of high and low voltage regulators, current limiting, three terminal regulator ICs like 78XX series and 2M 317. Switching mode regulators using IC PWM352

5. Signal Conditioning and data conversion

S/H circuits, analog MUX and DEMUX, D/A and A/D converters, electronic and analog computation, analog multipliers, precision AC/DC converters

List of Experiments:

1. Sweep circuit using UJT
2. Transistor bootstrap circuit
3. 555 as Astable and monostable multivibrator
4. 566 applications
5. Schmitt trigger
6. Triangular wave form generator
7. PWM modulator
8. Low and high voltage regulators using 723
9. A/D converter
10. D/A converter
11. Sample and hold circuit
12. Precision rectifiers

Term Work

Each student has to appear for atleast one written test during the term. Report on experiments (atleast eight from the list of suggested experiments) along with a graded answer paper shall be submitted as termwork

The distribution of marks is as :

Report on expts : 15 marks

Written test : 10 marks

Text Books

Pulse, Digital and switching waveforms – Millman and Taub, McGraw Hill publication

Microelectronics – Millman and Grabel, McGraw Hill publication

Integrated circuits – K.R.Botkar, Khanna publication

Reference Books

Linear integrated circuits – Dr.Roy Choudhury & Shail Jain, Wiley Eastern Limited publication

Designing with op-amps – Sergio Franco, McGraw Hill publication

Applied maths – 4
EXTC

Vector calculus and Analysis

- 1.1 Scalar and vector point functions, directional derivative, curl and divergence, Conservative, Irrotational and solenoidal fields
- 1.2 Line integral, Green's theorem for plane regions and properties of line integral, Stoke's theorem, Gauss' divergence theorem (without proof) related identities and deductions

Matrices

- 2.1 Brief Revision of vectors over real field, inner product, norm, linear independence and orthogonality of vectors
- 2.2 Characteristic polynomial, characteristic equation, characteristic roots and characteristic vectors of a square matrix, properties of characteristic roots and vectors of different types of matrices such as orthogonal matrix, hermitian matrix, skew- hermitian matrix, diagonal matrix, cayley hamilton's matrix (without proof), Functions of a square matrix, Minimal polynomial and derogatory matrix
- 2.3 Quadratic forms, congruent and orthogonal reduction of quadratic form, Rank, Index, Signature and class value of quadratic form

Complex variables

- 3.1 Line integral of a function of complex variable, Cauchy's theorem for analytic function (with proof), Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's integral formula and deductions
- 3.2 Singularities and poles :
Taylor's and Laurent's development (without proof), Residue at isolated singularity and its evaluation
- 3.3 Residue Theorem application to evaluate real integrals of type:
 $\int_0^{2\pi} f(\cos X, \sin X) dX$ and $\int_{-\infty}^{\infty} f(X) dX$

References :

Complex variable- Churchill, McGraw Hill, 2nd edition, 1960

Theory of Function Complex variable – Shantinakaran, S.Chand & Co, 1979
Engineering Mathematics – S.S.Sastri, Prentice Hall of India, 2nd edition, 1989
Element of Applied Mathematics – P.N.Wartikar / J.N.Wartikar , Pune Vidyarthi Griha
Prakashan, 1981
