RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

BE-3001 Mathematics-III

(Syllabus for CS, IT, & EC Branches)

COURSE OBJECTIVE- The objective of this course is to fulfill the needs of Engineers to understand the Applications of Fourier Series, Fourier & Laplace Transforms and Statistical Techniques in order to acquire Mathematical knowledge and to Solving a wide range of Practical Problems Appearing in the CS/IT/EC discipline of Engineering.

Course Contents

Fourier Series: Fourier Series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, Half-range Fourier series, Complex form of Fourier Series.

Integral Transforms:
Fourier Transform: Complex Fourier Transform, Fourier Sine and Cosine Transforms, Applications of Fourier Transform in Solving the Ordinary Differential Equation.
Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary Functions, Properties of Laplace Transform, Change of Scale Property, First and Second Shifting Properties, Laplace Transform of Derivatives and Integrals. Inverse Laplace Transform & its Properties, Convolution theorem, Applications of Laplace Transform in solving the Ordinary Differential Equations.

Random Variables: Discrete and Continuous Random Variables, Probability Function, Distribution Function, Density Function, Probability Distributions, Mean and Variance of Random Variables.

Distribution: Discrete Distributions- Binomial & Poisson Distributions with their Constants, Moment Generating Functions, Continuous Distribution- Normal Distribution, Properties, Constants, Moments.
Curve Fitting using Least Square Method.

COURSE OUTCOMES- The curriculum of the Department is designed to satisfy the diverse needs of students. Coursework is designed to provide students the opportunity to learn key concept of Applications of Fourier Series, Fourier & Laplace Transforms and Statistical Techniques.

EVALUATION- Evaluation will be continuous, an integral part of the class as well as through external assessment.

Reference:

1. Probability & Statistics by G Shanker Rao, University Press.
2. Mathematical Statistics by George R., Springer
3. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
4. H C Taneja: Advanced Engineering Mathematics, I.K. International Publishing House Pvt. Ltd.
5. S S Sastri: Engineering Mathematics, PHI
6. Ramana, B.V.: Advance Engg. Mathematics, TMH New Delhi
7. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication
8. Probability and Statistics in Engineering, W.W. Hines et. al., Wiley India PVT Ltd.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

EC-4002 SIGNAL AND SYSTEMS

COURSE OBJECTIVE:
The focus of this course is to introduce you to the fundamental concepts and tools used in both analogue and digital signal processing (ASP and DSP) which are areas of interest if you are studying any program relating to electronic, communication and/or computer engineering.

COURSE CONTENTS:
Overview of signals: Basic definitions. Classification of signals, Continuous and discrete time signals, Signal operations and properties, discretization of continuous time signals, Signal sampling and quantization.

Continuous Time and DiscreteTimeSystem characterization: Basic system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems.

Response of Continuous Time–LTI System: Impulse response and convolution integral, properties of convolution, signal responses to CT-LTI system.

z-Transform: Introduction, ROC of finite duration sequence, ROC of infinite duration sequence, Relation between Discrete time Fourier Transform and z-transform, properties of the ROC, Properties of z-transform, Inverse z-Transform, Analysis of discrete time LTI system using z-Transform, Unilateral z-Transform

Discrete Time System: Impulse response characterization and convolution sum, Causal signal response to DT-LTI systems. Properties of convolution summation, Impulse response of DT-LTI system and its properties.

Fourier analysis of discrete time signals: Introduction, Properties and application of discrete time Fourier series, Representation of Aperiodic signals, Fourier transform and its properties, Convergence of discrete time Fourier transform, Fourier Transform for periodic signals, Applications of DTFT

Systems with Finite and infinite duration response: Recursive and non-recursive discrete time systems-realization structures-direct form-I, direct form-II, Transpose, cascade and parallel forms, state space analysis: Representation and solution for continuous and discrete time LTI system.

COURSE OUTPUT:
As an outcome of completing this course, students should be able to
1. Understand the terminology of signals and basic engineering systems.
2. Understand the role of signals and systems in engineering design and society.
3. Understand signal representation techniques and signal characteristics.

4. Understand the difference and the applications of analog versus discrete signals and the conversion between them.
5. Understand the process of sampling &Fouriertransforms.

TEXT BOOKS
1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, PearsonEducation.
2. A. Anandkumar signal and system 3rdEdition, PHI.
3. http://www.nptelvideos.in/2012/11/estimation-of-signals-and-systems.html

REFERENCES:
1. Edward W. Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education.
2. H. P. Hsu, RakeshRanjan "Signals and Systems", Schaum's Outlines, Tata McGrawHill.
3. Simon Haykins and Barry Van Veen: Signals and Systems, John Wiley & sons.
4. Rawat: Signal and Systems, Oxford Publication.
5. Nagoorkani: signal and system (TMH).
6. Iyer: signal and system, Cengage learning.
7. Gabel, Roberts, "Signals and Linear Systems" Wiley India Pvt. Ltd, 2012.
8. Rao: Signal and system (TMH).

List of Experiments:
Introduction to MATLAB
1. To implement delta function, unit step function, Ramp function.
2. To explore the commutation of even and odd symmetries in a signal with algebraic operations.
3. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).
4. To explore the time variance and time invariance property of a given system.
5. To explore causality and non-causality property of a system.
6. To demonstrate the convolution and correlation of two continuous-time signals.
7. To demonstrate the convolution and correlation of two discrete-time signals.
8. To determine Magnitude and Phase Response of Fourier Transform of given signals.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

EC-4003 Integrated Circuits and its Applications

COURSE OBJECTIVE: The objective of this course is to deal with integrated circuits which are imperative and versatile requirement in today's electronics. Operational amplifier is a device which is used in various electronics application, such as summer, integrator and differentiator and so on. This course comprehends the introduction of various IC's such as IC-741, TL082, and IC-555 timer. The course also deals with the analysis and design of circuits including analog signal processing using linear ICs.

COURSE CONTENTS:

Feedback Amplifier and Oscillators: Concept of feedback and their types, Amplifier with negative feedback and its advantages. Feedback Topologies.
Oscillators: Concept of Positive feedback,Classificationof Oscillators,Barkhausen criterion,Types of oscillators:RCoscillator, RC Phase Shift,Wien Bridge Oscillators. LC Oscillator: Hartley, Colpitt's, Clapp and Crystal oscillator.

Introduction to integrated circuits: Advantages and characteristic parameters of IC's, basic building components, data sheets,

Operational Amplifier: Differential amplifier and analysis,Configurations- Dual input balanced output differential amplifier,Dual input Unbalanced output differential amplifier,Single input balanced output differential amplifier,Single input Unbalanced output differential amplifier Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an ideal op-amp, Power supply configurations for OP-AMP.
Characteristics of op-amp: Ideal and Practical, Input offset voltage, offset current, Input bias current, Output offset voltage, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio (CMRR), Slew rate and its Effect, PSRR and gain bandwidth product, frequency limitations and compensations, transient response, analysis of TL082 datasheet.

OP-AMP applications: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO,Comparator, Zero Crossing Detector.
OP-AMP AS 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,AGC,AVC using op-AMP.

TIMER:IC-555 Timer concept,Block pin configuration of timer. Monostable, Bistable and AstableMultivibrator using timer 555-IC,Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

Voltage Regulator:simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs.

List of Experiments
Apparatus Required –Function Generator, TL082, MPY634/ASLK Pro, Power Supply, Oscilloscopes, connecting wires, bread board.
1. To determine voltage gain and frequency response of inverting and non-inverting amplifiers using IC-741.
2. To measure offset voltages, bias currents, CMRR, Slew Rate of OPAMP using IC-741.
3. To design an instrumentation amplifier anddetermine its voltage gainusing IC-741.
4. To design op-amp integrator (low pass filter) and determine its frequency response.
5. To design op-amp differentiator (high pass filter) and determine its frequency response.
6. To design Analog filters – I and II and analyse its characteristics.
7. To design Astable,Monostable andBistablemultivibrator using IC-555and analyse its characteristics.
8. Automatic Gain Control (AGC) Automatic Volume Control (AVC).

COURSE OUTPUT:
Upon successful completion of this course students will able to understand the working of different integrated circuits, their pin configurations and about their applications. Students will also able to understand the performance of ICs on practical basis.

TEXT BOOKS:
1. RamakantA.Gaikward,"OP- Amp and linear Integrated circuits"Third edition-2006, Pearson.
2. B. VisvesvaraRao Linear Integrated Circuits Pearson.
3. http://www.nptelvideos.in/2012/11/analog-ics.html

REFERENCES:
1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press, 2nd edition,2010.
2. D. Roy Choudhury:Linear Integrated Circuits New Age Publication.
3. B. Somanathan Nair: Linear Integrated Circuits analysis design and application Wiley India Pvt. Ltd.
4. Maheshwary and Anand: Analog Electronics, PHI.
5. S.Salivahanan,V S KanchanaBhaaskaran: Linear Integrated Circuits",second edition, McGraw Hill.
6. Gray Hurst Lewis Meyer Analysis and design of analog Integrated Circuits fifth edition Wiley India.

7. RobertF.Coughlin, Frederick,F.Driscoll: Operational Amplifiers and Linear Integrated Circuits, sixth edition, Pearson.
8. Millman and Halkias: Integrated electronics, TMH.
9. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
10. Sedra and Smith: Microelectronics, Oxford Press.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

<u>EC-4004 Communication Systems</u>

Course Objective

The course is designed to cover the fundamentals, principles, concepts, and techniques of analog communication systems like various modulation techniques, data transmission, communication technologies, time-domain and frequency domain multiplexing technique and noise analysis.

Syllabus

Frequency domain representation of signal: Fourier transform and its properties, condition of existence, Fourier transform of impulse, step,signum , cosine, sine, gate pulse, constant, properties of impulse function. Convolution theorem (time & frequency), correlation(auto & cross), energy & power spectral density.

AM modulation: Block diagram of a communication system,need of modulation, types of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power requirement, efficiency. AM suppressed carrier(DSB-SC, SSB-SC, VSB-SC) Power requirement, efficiency waveform equation and frequency domain representation, Generation of AM, DSB-SC, SSB-SC, VSB-SC & its detection,synchronous generation& detection & errors.

AM transmitter& receiver: Tuned radioreceiver &super heterodyne, limitation of TRF, IF frequency, image signal rejection, selectivity, sensitivity and fidelity,Noise in AM, FM

Angle modulation: Types of angle modulation, narrowband FM,wideband FM, its frequency spectrum, transmission BW, methods of generation (Direct & Indirect), detection of FM (discriminators: balanced, phase shift and PLL detector),pre emphasis and de-emphasis.

FM transmitter & receiver: Block diagram ofFM transmitter& receiver, AGC, AVC, AFC,

Noise: Classification of noise,Sources of noise, Noise figure and Noise temperature, Noise bandwidth, Noise figure measurement, Noise in analog modulation, Figure of merit for various AM andFM, effect of noise on AM &FM receivers.

Course Outcomes

Students who are successful in this class will demonstrate at least the abilities to:
1. Solve communication engineering Problems using the knowledge of time domain & frequency domain.
2. Analyze various analog modulation schemes for communication systems.
3. Analyze and compare the noise performance of various analog communication systems.
4. Understand the basic of digital transmission system.

TEXT BOOKS
1. Simon Haykins, Communication System, John Willy
2. Singh &Sapre, Communication System, TMH
3. http://www.nptelvideos.in/2012/11/communication-engineering.html

REFERENCES
1. B.P. Lathi, Modern Digital and analog communication system; TMH
2. Singhal, analog and Digital communication, TMH
3. Rao, Analog communication, TMH
4. P K Ghose, principal of communication of analog and digital, universities press.
5. Taub& shilling, Communication System, TMH
6. Hsu; Analog and digital communication(Schaum); TMH
7. Proakis fundamental of communication system. (Pearson edition).

List of experiment
1. To analyze characteristics of AM modulator & Demodulators.
2. To analyze characteristics of FM modulators& Demodulators.
3. To analyze characteristics of super heterodyne receivers.
4. To analyze characteristics of FM receivers.
5. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
6. To analyze characteristics of Automatic volume control and Automatic frequency control.
7. To construct frequency multiplier circuit and to observe the waveform.
8. To design and analyze characteristics of FM modulatorand AM Demodulator using PLL.

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Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

EC-4005 Control systems

OBJECTIVES

1. To provide sound knowledge in the basic concepts of linear control theory and design of control system.
2. To understand the methods of representation of systems and getting their transfer function models.
3. To provide adequate knowledge in the time response of systems and steady state error analysis.
4. To give basic knowledge is obtaining the open loop and closed–loop frequency responses of systems.
5. To understand the concept of stability of control system and methods of stability analysis.
6. To study the various ways of designing compensation for a control system.

Course Contents

Introduction to Control system
Terminology and classification of control system, examples of control system, Laplace Transform and its application, mathematical modeling of mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems
Open loop and closed loop systems, effect of feedback on control system and on external disturbances, linearization effect of feedback, regenerative feedback.

Time response analysis
Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis
Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Frequency response analysis
Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots, closed-loop frequency response.

Frequency domain stability analysis

Nyquist stability criterion, assessment of relative stability using Nyquist plot and Bode plot (phase margin, gain margin and stability).

Approaches to system design
Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation.

State space analysis
State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

Course Outcomes:
Students who are successful in this class will demonstrate at least the abilities to:
1. Demonstrate an understanding of the fundamentals of (feedback) control systems.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Express and solve system equations in state-variable form (state variable models).
4. Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
5. Determine the (absolute) stability of a closed-loop control system
6. Apply root-locus technique to analyze and design control system.

Text books –
1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Wiley India Pvt. Ltd, 9th edition.
3. http://www.nptelvideos.in/2012/11/control-engineering.html

 REFERENCES
1. A. Anand Kumar, " Control Systems" PHI, New Delhi, 2007
2. Norman S. Nise, Control System Engineering, Wiley India Pvt. Ltd.
3. R. Anandnatarajan, P. Ramesh Babu, "Control System Engineering" Scitech Publication (India) Pvt. Ltd. 2014
4. Distefano (schaum series) Control Systems TMH
5. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.
6. Manik, Control System, Cengage Learnings.
7. Stefani shahian- Design of feedback control system oxford university press.
8. Salivahanan Control Systems engg. Pearson Education, New Delhi
9. K. Ogata, 'Modern Control Engineering', Pearson Education, New Delhi
10. B.S. Manke linear control system, khanna publishers

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Credit Based Grading System

Electronics & Communication Engineering, IV-Semester

EC-4006 Simulation Lab

COURSE OBJECTIVE:
The focus of this course is to introduce the fundamental concepts and tools of electronic circuit designing software & let students acquaint with the software being used in the electronic circuit designing industries.

COURSE CONTENTS:
Introduction to circuit simulation software (TINA-PRO/ PSPICE/ CIRCUIT MAKER).
Study of the key features and applications of the software in the field of Electronic Circuits, Electronic Instrumentation and Network Analysis.
Design, Optimization and simulation of;
1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc).
2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.
3. Use of virtual instruments built in the software.

Introduction to PCB layout software
  Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software.
Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

COURSE OUTCOMES:
After completion of this course students should be able to,
  1. Understand the basics of electronic circuit designing software's.
  2. Design & simulate various electronic circuits.
  3. Analyze the circuit's behavior & characteristics.
  4. Verify the characteristics obtained after simulation by implementing circuits on bread board practically.
  5. Simulate and design the PCB layout.