Course Title: Signals and Systems
Course Code: EEEG 221
Credit Hours: 3

Course Description:
This course intends to make student understand the properties of continuous and discrete time signals and systems used in all branches of electrical engineering.

Course Contents:

Unit 1: Introduction
Signal classification: Continuous time and Discrete time signals, Continuous valued and Discrete valued signals, Deterministic and Random signals, Multidimensional Signals, Transformation of signals: Time shifting, Time scaling, Time reversal, Combined operation, Singularity Functions: Unit impulse, Unit Step and Unit Ramp, Elementary Signals: Real exponential, Complex exponential and signum, Periodic and aperiodic Signals. Energy and Power signals, Even and odd signals, Orthogonal signals, Casual, anticasual and noncasual signals.

Unit 2: Basic System and Properties
Continuous Time and Discrete Time systems, Linear and Nonlinear systems, Time varying and Time invariant system, Properties of LTI-systems, Continuous-time LTI-systems: the convolution integral; Discrete-time LTI-systems: the convolution sum, Impacts of non-linearity and time variation on system properties

Unit 3: Continuous Time Fourier series and Transform
Introduction of Fourier series, Fourier integral: Representation of aperiodic and periodic signals; Forward and reverse/inverse Fourier transforms; Fourier transforms properties. Dirichlet condition, Parseval's theorems

Unit 4: Discrete Time Fourier series and Transform
Discrete time Fourier series: Representation of periodic signals and properties; discrete time Fourier transform (DTFT): Representation of aperiodic signals; Forward and inverse/reverse DTFT; Properties of DTFT

Unit 5: Sampling and Correlation of Signals
Sampling, The sampling theorem, Aliasing, Conversion to discrete time signals, Reconstruction and zero-order hold compensation. Sampling rate conversion, Practical aspect of sampling, Correlation of signals, Cross-correlation of Energy and Power signals, Auto-correlation of Energy and Power signals, Auto-correlation sequence of discrete time signal, Properties of Cross-correlation and Auto-correlation sequences

Unit 5: Noise, Stochastic signals and Spectral Density
Noise, Stochastic signals, Energy Spectral Density of signals (ESD), Power Spectral Density (PSD) of signals, PSD of periodic signal, PSD of white noise.

Unit 6: Signal Mixing and Filtering

Introduction of signal mixing, Ideal signal mixer, Signal multiplier. Process of eliminating unwanted noise, Ideal and Practical Filter, Frequency response and Bode plots of typical filter, Types of filters in terms of frequency response, passive and active filters, design of analog filters

References:

1. Alexander D. Poularikas, Samuel Seely, *Signals and Systems,* 2nd Ed., PWS- Kent Publishers 1991
2. Alan V. *Oppenheim,* Alan S. Willsky With S. Hamid Nawab, *Signals and Systems*, PHI 1995
3. Chi Tsong Chen, *System and Signal Analysis*, Saunders College Publishing
4. Dimitris Manolakis and John G Proakis, *Digital Signal Processing*, 2nd Ed., PHI 1995
5. M. E. Van Valkenberg, *Analog Filter Design*, HRW Inc. New York 1982

Evaluation:

In-Semester Evaluation: 50%
End-Semester Evaluation: 50%