**Course Title: Signals and Systems**
**Course Code: EEEG 313**
**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. A. D. Poularikas, S. Seely, *Signals and Systems,* 2nd Ed., PWS- Kent Publishers 1991
2. A.V. Oppenheim, A. S. Willsky , S. Hamid Nawab, *Signals and Systems*, PHI 1995
3. C. T. Chen, *System and Signal Analysis*, Saunders College Publishing
4. D. Manolakis, J.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%