**PEE301 DIGITAL SIGNAL PROCESSING AND APPLICATION**

| L | T | P | Cr |
|---|---|---|---|
| 3 | 1 | 2 | 4.5 |

**Course Objectives:** To introduce with concept of continuous and discrete signals, Frequency analysis of signals, design of digital filters , to explain z-transform and FFT transform

**Overview:** Concept of frequency in continuous and discrete time signals, A–D Conversion process, Sampling Theorem, Introduction and classification of discrete time signals and systems, Analysis of discrete linear time-invariant (LTI) systems, Convolution and correlation of discrete time signals, Implementation of discrete time systems.

**Z-Transform:** Z-Transform and inverse z-transform, rational z-transform, Analysis of Linear Time Invariant (LTI) systems in z-domain.

**Frequency Analysis of Signals and System:**Frequency analysis of continuous and discrete time signals, Fourier series and Fourier Transform for discrete and continuous periodic and non periodic signals.

**Discrete Fourier Transform:** Frequency domain sampling, Discrete Fourier Transform (DFT), Linear filtering methods based on DFT, Frequency analysis of signals using DFT, Fast Fourier Transform (FFT), FFT algorithms, Methods and Applications of FFT algorithms.

**Digital Filter Design:** Digital filter, filter design, Infinite Impulse Filter (IIR), finite Impulse filters (FIR)

**Multirate Signal Processing:** Decimation and Interpolation, Sample rate conversion by Integer and Non-Integer factors.

**Random Signals:**Random variables, random process, auto-correlation functions, power spectrum density, filtering random signals, window function, wavelet transform, spectrum analysis of random signals.

**Applications to Power Systems** : DSP applications to power systems such as measurement of frequency, measurement of harmonic level, harmonic analysis, static and digital relays, digital protection, power metering, magnetic field measurement.

**Laboratory Work :** Determination of Z, Fourier transform, Design of FIR and IIR Filters, Realization of Prediction, equalizer and compression algorithms, use of wavelet transform,

**Course Learning Outcome:** On the completion of the course, the student will be able

- To learn to apply z-transform and FFT analysis
- To analyse continuous and discrete signals in frequency domain.
- To implement the concepts for measurement of frequency, harmonic level etc.
- To design digital filters for reduction of noise signals
- To apply concepts of DSP to power system protection for measurement of signals.

***Recommended Books***


1. *Proakis, J.G., and Manolakis D.G., Digital Signal Processing, Prentice Hall of India Private Limited, (1996).*
2. *Rabiner, C.R., and Gold, B., Theory and Applications of Digital Signal Processing, Prentice Hall of India Private Limited (2000).*
3. *Helmut, U., Wilibald, W. and Andrzej, W., Protection Techniques in Electrical Energy Systems, CRC Press, New York (1995).*
4. *Oppenhein, A.V., and Schafer, R.W., Discrete Time Signal Processing, Prentice Hall of India Private Limited (2001).*


**Evaluation Scheme:**

| S. No. | Evaluation Elements | Weightage (%) |
|---|---|---|
| 1. | MST | 25 |
| 2. | EST | 35 |
| 3. | Sessionals (May include Assignments/Projects/Tutorials/Quizes etc.) | 40 |