**PC 401 IT SIGNALS AND SYSTEMS**

Instruction: (3L+1T) Hrs/Wk

Duration of University Examination: 3 Hours

University Examination(SEE): 70 Marks

Sessionals(CIE): 30 Marks

**Course Objectives:**

1. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.
3. To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

**UNIT-I**

Some useful operations on signals: Time shifting, Time scaling, Time inversion.

Signal models: Impulse function, Unit step function, Exponential function, Even and odd signals.

Systems: Linear and Non-linear systems, Constant parameter and time varying parameter systems, Static and dynamic systems, Causal and Non-causal systems, Lumped Parameter and distributed parameter systems, Continuous-time and discrete-time systems, Analog and digital systems.

**UNIT-II**

Fourier Series:

Signals and Vectors, Signal Comparison: correlation, Signal representation by orthogonal signal set, Trigonometric Fourier Series, Exponential Fourier Series, LTI system response to periodic inputs.

**UNIT-III**

Continuous-Time Signal Analysis:

Fourier Transform: Aperiodic signal representation by Fourier integral, Fourier Transform of some useful functions, Properties of Fourier Transform, Signal transmission through LTI Systems, ideal and practical filters, Signal energy.

Laplace transform: Definition, some properties of Laplace transform, solution of differential equations using laplace transform.

**UNIT-IV**

Discrete-time signals and systems: Introduction, some useful discrete-time signal models, Sampling continuous-time sinusoids and aliasing, Useful signal operations, examples of discrete-time systems.

Fourier Analysis of discrete-time signals, periodic signal representation of discrete-time Fourier Series, aperiodic signal representation by Fourier integral.

**UNIT-V**

Discrete-time signal analysis:

Z-Transform, some properties of Z-Transform, Solution to Linear difference equations using Z-transform, System realization. Relation between Laplace transform and Ztransform.

DTFT: Definition, Properties of DTFT, comparison of continuous-time signal analysis with discrete-time signal analysis.

**Suggested Reading:**

1. B. P. Lathi, Linear Systems and Signals, Oxford University Press, 2nd Edition, 2009.

2. Alan V O P Penheim, A. S. Wlisky , Signals and Systems, 2nd Edition, Prentice Hall.

3. Rodger E. Ziemer, William H Trenter, D. Ronald Fannin, Signals and Systems, 4th Edition, Pearson 1998.

4. Douglas K. Linder, Introduction to Signals and Systems, McGraw Hill, 1999.

5. P. Ramakrishna Rao, Signals and Systems, TMH.