CT203 - Signals and Systems

Course placement: Core course for second year students of BTech ICT program.

Course format: 3 hours lecture and 2 hours practical (lab) in every week. (L-T-P-Cr): 3-0-2-4

Course objective:
Signals and systems course is a pre-requisite for several important topics such as digital signal processing, analog and digital communication, image processing, speech processing etc. The course aims to introduce the concept of signals and systems. Both continuous time and discrete time signals will be covered along with their analysis in frequency domain. Further, characteristics of systems and their response to different signals will be discussed.

Books:

1. A. V. Oppenheim, A. S. Wilsky and S. H. Nawab, "Signals and Systems," *2nd* edition, Prentice-Hall of India, 1999.
2. B. P. Lathi, "Linear Systems and Signals," Berkeley-Cambridge Press, 1992.
3. Simon Haykin, "Signals and Systems,"

Assessment method: two in-semester examinations, and a final examination and lab (25+25+30+20).

Course outcome:

- Students can develop signals and systems concept for modeling physical processes for different applications, would be able to analyze practical systems for different inputs, and would be able to design necessary filters (both analog and digital) for practical applications.

- This course is the gateway to many important courses at undergraduate and postgraduate levels such as analog and digital communication systems (in fact there cannot be any communication without fundamental knowledge of this course), digital signal processing (DSP), advanced DSP, digital image processing, acoustics, speech communication, seismology, control system engineering.

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	PS1	PS2	PS3
X		**X**									**X**	**X**		**X**

Lecture Schedule

Sl. No.	Description		No. of Lectures
1	**Signals**		**6**
	1.1	Continuous time and discrete time signals; Periodic and aperiodic signals; Even and odd signals; Signal energy and power	3
	1.2	Basic signals (unit step, unit impulse, ramp, exponential, sinusoids), transformations of the independent variable (shifting, scaling, reversal)	3
2	**Systems**		**6**
	2.1	Properties: linearity, time invariance, causality, memory, stability	3
	2.2	Linear and time invariant system, impulse response, convolution integral	3
3	**Fourier Series**		**6**
	3.1	Representation of periodic signals	4
	3.2	Parseval's relation	2
4	**Continuous time Fourier transform**		**6**
	4.1	Properties	4
	4.2	Introduction to filters	2
5	**Discrete time Fourier transform**		**7**
	5.1	Sampling theorem	2
	5.2	Properties	3
	5.3	Frequency sampling, Circular convolution	1
	5.4	Discrete Fourier transform	1
6	**Laplace transforms (LT)**		**4**
	6.1	Generalization of CTFT to LT	2
	6.2	Poles and zeros, region of convergence	1
	6.3	Properties	1
	6.4	Butterworth filter	1
7	**Z transforms**		**3**
	7.1	Generalization of DTFT to Z	1
	7.2	Poles and zeros, region of convergence	1

	7.3	Properties	1
7	**Random processes**		**2**
	7.1	Auto correlation function, power spectral density	1
	7.2	Stationary processes	1