Course code	Course Name	L-T-P-Credits	Year of Introduction
IC305	SIGNALS AND SYSTEMS	3-0-0-3	2016

Prerequisite: Nil

Course Objectives

- To introduce the fundamental characteristics and classification of signals and systems
- To impart knowledge on various transforms
- To develop the mathematical skills to solve problems involving convolution and transforms

Syllabus

Signal classification and representations- Basic signal operations- System representation and classification- LTI systems and convolution- Fourier representations- Laplace Transforms- Z Transforms

Expected Outcome

After the completion of the course, students will be able to

i. Explain about general signals and system properties
ii. Compute convolution sum and integrals
iii. Represent signals and systems in time and frequency domains
iv. Compute Fourier representation of different types of signals
v. Compute Laplace and Z-transforms

Text book

1. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley & Sons, 2001.Reprint 2002

Reference books:

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, Signals and Systems, Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. B. P. Lathi, Linear Systems and Signals, Oxford University Press, 2005
3. H. P Hsu, R. Ranjan, Signals and Systems, Scham's outlines, TMH, 2006

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Signal classification and representation - Random/ deterministic, Continuous/ Discrete, Digital/ Analog, Power/Energy, Even/Odd, Periodic/ Aperiodic Classifications Representation of continuous and discrete signals Special signals (impulse function, unit step function, unit sample function)	4	15%
	Basic Signal operations - Shifting, Scaling and Time Reversal operations on continuous and discrete signals	3	
II	System Representation and Classification - Linear/Non-Linear, Dynamic/Static, Causal/Non-causal, Shift (time) invariant/ Shift (time) variant classifications for continuous and discrete systems. Stability of Systems.	4	15%

	Linear Time Invariant Systems - Impulse response of continuous LTI system, Unit sample response of discrete LTI Systems, Convolution integral and its properties, convolution sum and its properties. Stability of LTI systems.	3	
FIRST INTERNAL EXAM			
III	Frequency domain Representation of Signals - Fourier series representation of continuous periodic signals Fourier Transform representation of continuous signals, Properties of Fourier transform	7	**15%**
IV	Fourier series representation of Discrete time periodic signals - Discrete Time Fourier Transform (DTFT) representation of discrete signals, Properties of DTFT. Parseval's Theorem and Convolution Theorem in Fourier Transform domain and DTFT domain.	7	**15%**
SECOND INTERNAL EXAM			
V	Laplace Transform and properties - Laplace transform definition (unilateral and bilateral), Region of Convergence, properties and Theorems, Laplace transform representation of signals and systems, Inverse Laplace Transform, Laplace Transform analysis of LTI systems.	7	**20%**
VI	Z Transform and Properties - Z Transform, Mapping of s plane to Z plane, Region of Convergence, Properties of z-transform, Inverse z-transform. Difference Equations- Analysis of discrete linear time invariant systems using z-transform. Unilateral Z Transform, Properties, Initial and Final value Theorems.	7	**20%**
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3 Hours

Part A

Answer any two out of three questions uniformly covering Modules 1 and 2. Each question carries 15 marks and can have not more than four sub divisions. (15 x 2 = 30 marks)

Part B

Answer any two out of three questions uniformly covering Modules 3 and 4. Each question carries 15 marks and can have not more than four sub divisions. (15 x 2 = 30 marks)

Part C

Answer any two out of three questions uniformly covering Modules 5 and 6. Each question carries 20 marks and can have not more than four sub divisions. (20 x 2 = 40 marks)