

Bachelor of Technology in Electronics and Computer Engineering

Short Syllabus

Discipline Core Courses

BECM301L Signal Processing (3-0-0-3)

Signal and Systems - classification-continuous and discrete, Operations on signals; System Analysis using Z-Transform - Z-transform, Properties, S-plane to Z-plane mapping; Fourier Transforms in Discrete Domain - Review of Continuous-time Fourier transform, Discrete-time Fourier transform; Design of Digital FIR Filters - Design characteristics of FIR filters with linear- phase; Design of Digital IIR Filters - Analog low pass filter; Digital filter Structures - Basic FIR and IIR digital filter structures

Course Code	Course Title	L	T	P	C
BECM301L	Signal Processing	3	0	0	3
Pre-requisite	BMAT102L	Syllabus version			
		1.0			
Course Objectives					
1. To understand the characteristics of signals, systems in time and frequency domain with the corresponding transformations. 2. To analyse the signals and systems in time and transformed domains such as DTFT, Z-transform and DFT. 3. To inculcate the design concepts of digital FIR filters, analog and digital IIR Filters. 4. To instill diverse structures for realizing digital filters. 5. To provide an insight into digital signal processors. 6. To learn the usage of appropriate tools for realizing signal processing modules					
Course Outcome					
On studying this course, students will be able to 1. Differentiate between various types of signal and understand the systems in continuous and discrete domain. 2. Comprehend, classify and analyse signals in time and frequency domain transformations 3. Analyze of DT systems using Z-transform. 4. Comprehend various analog filter design techniques and be able to design digital filters 5. Able to realize digital filters using various system interconnections 6. Understand the types and architecture of digital signal processors. 7. Design and implement systems using the imbibed signal processing concepts					
Module:1	Signal and Systems	6 hours			
Signals: classification-continuous and discrete, Operations on signals, Sampling, System - classification, Discrete time convolution and correlation.					
Module:2	System Analysis using Z-Transform	6 hours			
Z-transform, Properties, S-plane to Z-plane mapping, Inverse z-transform, Solution to difference equations using z-transform, Region of convergence, Stability analysis					
Module:3	Fourier Transforms in Discrete Domain	8 hours			
Review of Continuous-time Fourier transform, Discrete-time Fourier transform - Dirichlet's Conditions, Magnitude and phase response, Parseval's theorem, Gibbs Phenomenon. Properties of FT. DFT, Radix-2 FFT Algorithms – Decimation In Time & Decimation In Frequency.					
Module:4	Design of Digital FIR Filters	6 hours			
Design characteristics of FIR filters with linear- phase – Frequency response of linear phase FIR filters, Design of FIR filters using windowing techniques -Rectangular, Bartlett, Hamming, Hanning and Blackmann					
Module:5	Design of Digital IIR Filters	6 hours			
Analog low pass filter -Butterworth and Chebyshev approximations, frequency transformation, Bilinear Transformation Technique					
Module:6	Digital filter Structures	7 hours			
Basic FIR and IIR digital filter structures - Direct Forms, Cascade, Parallel, Lattice and					

Lattice-Ladder structures			
Module:7	Digital Signal Processors		4 hours
Fixed-point Architecture -VLIW, Fixed-point and Floating-point coefficients, finite word length effects			
Module:8	Contemporary Topics		2 hours
Guest lecture from Industries and R & D Organizations			
	Total Lecture hours:		45 hours
Text Book(s)			
1.	John G. Proakis, Dimitris G Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 2022, 5th Edition, Pearson, USA		
Reference Books			
2.	Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd edition, Wiley Publications, 2021		
3.	P. Rama Krishna Rao and Shankar Prakriya, "Signals and Systems", 2 nd edition - Mc-Graw Hill, 2017		
4.	Lizhe Tan, Jean Jiang, Digital Signal Processing: Fundamentals and applications, 3rd edition, 2018, Academic Press, USA		
Mode of Evaluation: Continuous Assessment Test, Digital Assignment, Quiz and Final Assessment Test			
Recommended by Board of Studies		14-05-2022	
Approved by Academic Council		No. 66	Date 16-06-2022