National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Year of Regulation	**2019-20**
Department	**Electrical Engineering**	Semester	**VI**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE318	**Digital Signal processing**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

After the completion of the course, the student should be able to:

Course Objectives	Course Outcomes	
To make students familiar with the DSP concepts and aware about the implications of the properties of systems and signals.	CO1	**use** concepts of trigonometry, complex algebra, Fourier series, transform and properties, z-transform to analyze the operations on signals and acquire **knowledge** about Systems.
To learn time domain and frequency domain analysis	CO2	**select** proper tools, methods, processes, techniques for time domain and frequency domain evaluation.
To learn the different frequency transform techniques and apply on the digital filter design techniques	CO3	**design, implement, analyses** and compare digital filters for processing of discrete time signals
To learn the implementation techniques of digital filter and analyze its characteristics based on different conditions.	CO4	**integrate** computer-based tools, hardware knowledge components and their operation effects for engineering applications
	CO5	**employ** signal processing strategies at multidisciplinary team activities.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**1**	**2**	**1**	**2**	**2**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**0**
2	CO2	**2**	**1**	**1**	**2**	**2**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**2**	**1**	**1**
3	CO3	**2**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**2**	**3**	**3**
4	CO4	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**2**	**3**	**3**
5	CO5	**1**	**2**	**3**	**2**	**2**	**2**	**0**	**0**	**1**	**1**	**0**	**1**	**2**	**1**	**1**

SYLLABUS

No.	Content	Hours	COs
I	**Unit 1: Review of Discrete-Time Signals and Systems** Discrete - Time Signals, Signal Classification, Discrete - Time System And Analysis Of Discrete - Time Linear	**06**	**CO1**

	Time Invariant Systems, Correlation Of Discrete - Time Signals.		
II	**Unit 2: Fast Fourier Transform** Introduction, Direct Evolution Of DFT, The Fast Fourier Transform, Decimation-In-Time Algorithm, Summary Of Steps Of Radix-2 DIT-FFT Algorithm, Decimation-In-Frequency Algorithm, Summary Of Steps Of Radix-2 DIF-FFT Algorithm.	**07**	**CO2**
III	**Unit 3: Finite Impulse Response Filters** Causality And Its Implications, Linear Phase FIR Filters, Frequency Response Of Linear Phase FIR Filters, Location Of The Zeros Of Linear Phase FIR Filters, The Fourier Series Method Of Designing FIR Filters, Design Of FIR Filter Using Windows, Digital Differentiator, Hilbert Transformers, Frequency Sampling Method Of Designing FIR Filters, Optimum Equi-ripple Approximation Of FIR Filters.	**05**	**CO3**
IV	**Unit 4: Infinite Impulse Response Filters** Introduction, Frequency Selective Filter, Design Of Digital Filter From Analog Filter, Analog Low Pass Filter Design, Analog Low Pass Butterworth Filter, Analog Low Pass Chebyshev Filter, Comparison Between Butterworth Filter And Chebyshev Filter, Frequency Transformation In Analog Domain, Design Of High Pass, Bandpass And Bandstop Filters, Design Of IIR Filters From Analog Filters, Approximation Of Derivatives, Design Of IIR Filter Using Impulse Invariance Technique, Design of IIR Filter Using Bilinear Transformation, Frequency Transformation In Digital Domain	**06**	**CO3**
V	**Unit 5: Finite Word Length Effects in Digital Filters** Floating Point Numbers, Block Floating Point Numbers, Quantization Noise, Input Quantization Error, Product Quantization Error, Coefficient Quantization Error, and Quantization In Floating Point Realization Of IIR Digital Filters, Finite Word Length Effect In FIR Digital Filters	**04**	**CO4**
VI	**Unit 6: Realization of Digital Filter** Realization of FIR Filters, Transversal Structure, Linear Phase Realization, Lattice Structure Of An FIR Filter, Polyphase Realization of FIR Filter, Realization of Digital Filter, Direct Form-I Realization, Direct Form-11 Realization, Signal Flow Graph, Transposition Theorem And Transposed Structure, Cascade Form, 6 Parallel Form Structure, Lattice Structure Of IIR System, Comb Filter, All Pass Filter, Minimum Phase, Maximum Phase And Non-minimum Phase Systems.	**04**	**CO4**
VII	**Unit 7: Multirate Signal Processing** Introduction, Down Sampling, Spectrum of The Down Sampled Signal, Up Sampling Spectrum Of The Up-Sampled Signal, Anti-Imaging Filter, Cascading Sample Rate Converters, Efficient Transversal Structure For Decimator, Efficient Transversal Structure For Interpolator, Polyphase Structure Of Decimator, Polyphase Decimation Using The Z- Transform, Polyphase Structure Of Interpolator	**04**	**CO5**
Total Hours		**36**	

Essential Readings

1. Sanjit K. Mitra, "Digital Signal Processing: A Computer Based Approach," Tata McGraw-Hill, 4th Edition, 2013.

2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications,” Pearson Education, 4th Edition, 2007.
3. A. V. Oppenhein and R. W. Shafer, “Discrete-Time Signal Processing,” Pearson Education India, 4th Edition, 2007.
4. Tarun Kumar Rawat, “Digital Signal Processing,” Oxford University Press, 5th Edition, 2015.

Supplementary Readings

1. K. Padmanabhan, S. Ananthi, R. Vijayarajeswaran, “A Practical Approach to Digital Signal Processing,” New Age International, 2nd Edition, 2013.