FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **VIII**

Course Code: **202050803**

Course Title: **Digital Signal Processing and Applications**

Course Group: **Professional Elective Course-V**

Course Objectives: To provide a thorough understanding and working knowledge of various transform techniques, analyze the discrete time systems in time and frequency domain. To study and develop real problem solutions using DSP processor.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25/9	25/ 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to Digital Signal Processing** Introduction of Digital signals and systems , fundamentals of signal processing, block diagram and elements of digital signal processing system, Sampling as Impulse modulation, Sampled spectra and aliasing, Filtering, Practical aspects of the choice of sampling rate,	15
2	**Discrete-Time Signals and Systems** Z-transform & Inverse z-transform with their properties, linear convolution and its properties, difference equations and its solutions by Z transform, Discrete Time Fourier Transform, (DTFT), Properties of DTFT, Frequency response of Discrete time systems, Discrete Fourier(DFS) series and Properties of DFS	05

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3	**Realization of Discrete Time systems** Structure for Realization of IIR system ,Direct Form-I & II, Transposed form structure realization, cascade form ,Parallel form, Lettice structure form, Ladder structure form, Structure for Realization of FIR system, Direct form ,Transposed form, cascade from ,Lattice and Linear phase realizations	**05**
4	**Design of Digital Filters** Requirements for Transformations, IIR Filters, digital design using impulse invariant and bilinear transformation warping, pre warping, FIR design: windowing techniques, need and choice of windows, linear phase characteristics, analog filter design ,Butterworth and Chebyshev approximations	**07**
5	**Architecture of Digital Signal Processors and their Applications:** Introduction to architecture, features and addressing formats, Multiplier Accumulator (MAC) hardware, functional modes, fixed and floating mode DSP processors, introduction to commercial Digital Signal Processors and their applications	**10**

List of Practicals / Tutorials:

1	Introduction to MATLAB and generation of discrete time sinusoid signal.
2	Write a MATLAB program to obtain convolution of two sequences.
3	Write a MATLAB program to obtain z-Transform and Inverse Z-transform of signals
4	Write a MATLAB program to perform Fourier transform and Inverse Fourier transform of sequence
5	Write a MATLAB program to obtain Impulse response of the filter
6	Write a MATLAB program to perform parallel form realization of IIR filter and direct form to cascade form conversion.
7	Write a MATLAB program to obtain cascade form realization of FIR and IIR filters.
8	Write a MATLAB program to design of filter using bilinear Transformation
9	Write a MATLAB program to design Butterworth filter
10	Write a MATLAB program to design Chebyshev filter.
11	Write a MATLAB program to obtain response of FIR filter.
12	Write a MATLAB program to obtain response of low pass FIR Filter

Reference Books:

1	M.Gopal," Digital control and State variable Methods",Tata McGraw Hill,2005
2	J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, New Delhi, 2003.
3	A.Anand Kumar," Digital Signal Processing ",PHI Learning Private Limited,2016
4	S.K. Mitra, "Digital Signal Processing" – A Computer Based Approach", McGraw Hill Education, 2013
5	Alan V Oppenheim, Ronald W.Schafer, "Digital Signal Processing " Prentice Hall of India,2000

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Supplementary learning Material:	
1	http://www.nptel.ac.in

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
20%	30%	20%	10%	10%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To Understand digital signal analysis of discrete time systems	20
CO-2	To Understand applications of z- transforms and discrete Fourier Transformation	20
CO-3	Use of various transforms techniques for discrete time realizations	20
CO-4	Design and analysis various digital filters for processing of discrete time signals.	20
CO-5	Understand the key architectural features, application of Digital Signal Processor.	20

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Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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