

NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M. Tech. in Electronics & Communication Engineering (Embedded System)
M.Tech Semester - I

L	T	Practical component				C
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Course Code	6EC203CC22
Course Title	Digital Signal Processing and Applications

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. Design and implement various kinds of FIR, IIR and Adaptive filters
2. Design System based on multirate signal processing
3. Implement DSP algorithms and applications on DSP processor

Syllabus:

Teaching Hours:45

UNIT I: Review	06
Sampling theory & Basics of Transforms: DTFT, Z Transform, DFT, FFT, DCT and Digital Filter Design: FIR Filters, IIR Filters, Linear Phase filters	
UNIT II: Digital Signal Processor Architecture	05
Numeric Presentation and arithmetic, Special Architectural features, Addressing, Instruction set, Execution Control, On Chip Debugging, Power management, Digital filter Implementations in Fixed Point Systems	
UNIT III: Digital Filter Structures	05
Director form , Parallel form, Cascade form, Ladder form, Lattice form, Linear phase form, Analysis of Finite wordlength Effects on Digital filters	
UNIT IV: Multirate Signal Processing	10
Sampling rate Conversion, Nobel Identities, Digital filter Banks, & Filter Banks, Polyphase Filter structure, Over Sampling of ADC, Application Example: CD Player, Time-Frequency analysis, STFT, Wavelets basics and families of Wavelets, Wavelet Transform Coding of Signals,	
UNIT V: Linear optimum filters	09
Wiener filters in the discrete time domain, Linear prediction, Linear adaptive filters – Least-mean-square (LMS) algorithm, Recursive least-squares (RLS) based algorithms, Applications: Adaptive equalization, Speech coding, Spectrum analysis, Adaptive noise/interference cancellation, Adaptive beam forming, Adaptive control	
UNIT VI: Power Spectrum Estimation	05
Non-parametric and parametric methods; AR, MA, ARMA Models, periodogram ; eigen analysis algorithms	
UNIT VII: Case Study	05
Introduction to Codecs, Audio Lossy and Lossless codec, Video Lossy and Lossless codec	

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. Li Tan, DSP Fundamentals & Applications, Elsevier
2. Sanjit Mitra, DSP A Computer Based Approach , Tata McGraw Hill
3. Sen M Kuo, Woon Seng Gan, Digital Signal Processors, Architectural Implementations and Applications, Pearson Education
4. Fredric J. Harris, Multirate Digital Signal Processing for Communication Systems, Prentice Hall India