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	**6EC203**
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