BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
AUGSD
FIRST SEMESTER 2024- 2025
COURSE HANDOUT (PART II)

Date: 22 / 07 / 2024

In addition to Part I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No   : **ECE F434**
Course Title   : **Digital Signal Processing**
Instructor-in-charge : Rajesh Kumar Tripathy
Instructors   : Subhendu Kumar Sahoo, and Rajesh Kumar Tripathy

1. Course Description:

This course deals with the design of analog filters like Butterworth, Chebyshev, Elliptic., digital filter design for both IIR & FIR filters. Different filter structures for the realization of digital filters will be discussed. Finite word length effects and Multirate DSP will be introduced. DSP Processor architecture and implementation of DSP algorithms will be part of the course, which will be emphasized upon.

2. Scope and Objective:

The course aims at enumerating the theoretical and practical aspects of modern signal processing in a digital environment. It also aims at discussing application areas with particular stress on speech and image data.

3. Text Book:

1. Digital Signal Processing : Principles, Algorithms and Application", John G Proakis & D G Manolakis, PHI, 1998.
2. Digital Signal Processing, Sanjit K Mitra, TMH, Fourth Ed., 2013.

4. Reference Books:

1. "Digital Signal Processing: A Practical Approach, Second Edition", Emmanuel C. Ifeachor   and Barrie W. Jervis, Pearson education.
2. "Digital Signal Processing: Fundamentals and Applications", Li Tan, Elsevier.
3. "Digital Signal Processing", Oppenhiem & Schafer, Pearson Education Asia, 2002.
4. TI DSP Processor User Manuals
5. Digital Signal Processors, Architecture, Programming and Applications",B.   Venkataramani & M Bhaskar, TMH, 2002.
6. MATLAB Help

5. Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference
1	Overview of the course	Introduction to DSP	-------
2-4	Discrete time Fourier transform	CTFT, DTFT, Phase and group delay	TB2 Chapter 3
5-7	Z- Transform and its application	Basics of Z- transform and its use for analysis of LTI systems	TB2 Chapter 6

8,9	DSP Architectures	Numeric representation used in DSP, Architectural details of a typical DSP processor	TB2 Chapter 11.8-11.9, RB 2, Class notes
10, 11	Finite length discrete transform	DFT, FFT, DITFFT and DIFFT algorithms	TB2 Chapter 5
12-16	Analog filter design	Butterworth, Chebyshev, Elliptic	TB2 Appendix A, B Page 863-893
17,18	Analog filter design	Design of HP, BP and BS filters	TB2 Chapter A Page 863-893
19	Sampling	Sampling lowpass & bandpass signals	TB2 Chapter 3.8 – 3.10
20-22	Simple digital filters	Different LTI systems as frequency selective device.	TB2 Chapter 7.1-7.4
23, 24	Digital Filter design	IIR filter design: IIT, BLT	TB2 Chapter 9
25	Digital Filters	Linear phase FIR filters	TB2 Chapter 7.3
26-29	Digital Filter design	FIR Filter Design	TB2 Chapter 10
30, 31	Digital filter structures	Realization of IIR filters	TB2 Chapter 8.4-8.8
32, 33	Digital filter structures	Realization of FIR filters	TB2 Chapter 8.3, 8.9
34, 35	Finite Word-Length Effects	IIR & FIR Filters	TB2 Chapter 12
36, 37	Multi rate DSP	Decimators & Interpolators	TB2 Chapter 13.1, 13.2
38- 40	Adaptive Digital Filters	Introduction and Concepts of Adaptive filtering, Wiener Filters	RB2 10.1 – 10.3
41- 42	Introduction to Wavelet Transform	Wavelet Concepts and brief applications	Class notes

TB –Text Book
RB- Reference Book

6. Evaluation Scheme:

S. No.	Evaluation Component	Duration Min.	Weightage	Date. time, venue
1	Midsemester Exam	90	30%	As announced in the Timetable
2	Regular Lab, Lab Quiz	Regular	20%	Regular/ Will be announced
3	Quiz		10%	Will be announced
4	Comprehensive	120	40%	As announced in the Timetable

7. Chamber Consultation Hours: To be announced in the class.

8. Make-up Policy:
Make-up for any component will be given only in genuine cases. In all cases prior intimation must be given to IC.
There will be no makeup for Lab quiz and Quiz Exam components.

9. Notices: Notices regarding the course will be displayed on CMS.

Instructor - in - charge
ECE F434