

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE: **Electronics and Computer Engineering**

1. Subject Code: **EC - 411** Course Title: **Digital Signal Processing**

2. Contact Hours: **L: 3 T: 0 P: 0**

3. Examination Duration (Hrs.): **Theory**

0	3
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Practical

0	0
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4. Relative Weight: **CWS**

15

PRS

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MTE

35

ETE

50

PRE

00

5. Credits:

0	3
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 6. Semester

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Autumn

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Spring

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Both

7. Pre-requisite: **EC - 202**

8. Subject Area: **DCC**

9. Objective: This course aims to provide a detailed treatment of principles and algorithms of Digital Signal Processing (DSP), and implementation and applications of DSP algorithms.

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	Advantages and typical applications of DSP; Review of discrete-time signal and system analysis.	4
2.	Sampling and discrete-time processing of continuous time signals; Decimation and interpolation.	3
3.	Multirate DSP and its application in sampling rate conversion and high quality A/D and D/A conversion.	4
4.	Design of digital IIR filters: Impulse invariant, and bilinear transformation techniques for Butterworth and Chebyshev filters; Design of FIR filters: Windowing, optimum approximations of FIR filters; Multistage approach to sampling rate conversion.	8
5.	Properties and applications of DFT, implementing linear time invariant systems using DFT; Goertzel algorithm; FFT algorithms: Decimation in time, decimation in frequency; Implementation of DFT using convolution; DCT and its applications, audio and video coding, MPEG coding standards; FFT spectral analysis.	10
6.	Adaptive Wiener filter and LMS algorithm; Applications of adaptive filtering to echo cancellation and equalization.	3
7.	Filter banks; Polyphase structures; Quadrature-mirror filter bank: Two-channel and L-channel, applications to speech and audio coding.	7

8.	General and special purpose hardware for DSP; Digital signal processor trends, software radio.	3
Total		42

11. Suggested Books:

Sl. No.	Name of Books/ Authors	Year of Publication
1.	Mitra, S.K., "Digital Signal Processing-A Computer Based Approach", 3 rd Ed., Tata Mcgraw-Hill.	2005
2.	Oppenheim, A.V. and Schafer, R.W. with Buck, J.R., "Discrete Time Signal Processing", 2 nd Ed., Prentice-Hall of India.	2002
3.	Proakis, J.G. and Manolakis, D.G., "Digital Signal Processing: Principles, Algorithm and Applications", 4 th Ed., Pearson Education.	2007
4.	Ifeachor, E.C. and Jervis, B.W., "Digital Signal Processing: A Practical Approach", 2 nd Ed., Pearson Education.	2002
5.	Jeffrey, H.R., "Software Radio: A Modern Approach to Radio Engineering", Pearson Education.	2002