

ENG EC516 Digital Signal Processing

2008-2009 Catalog Data

ENG EC 516 Prereq: ENG EC 416, ENG EC 402, or ENG EC 415. Advanced structures and techniques for digital signal processing and their properties in relation to application requirements such as real-time, low bandwidth, and low-power operation. Optimal FIR filter design; time-dependent Fourier transform and filterbanks; Hilbert transform relations; cepstral analysis and deconvolution; parametric signal modeling; multidimensional signal processing; multirate signal processing. 4 cr.

Status in the Curriculum: Elective

Class/Lab Schedule:

LEC: 4 hrs/wk

Reference:

“Discrete-time Signal Processing,” by Oppenheim & Schaffer with Buck (Prentice Hall)

Recommended References:

“Signals & Systems,” by Oppenheim & Willsky, with Nawab (Prentice Hall)

Coordinator/Lecturer:

S. Hamid Nawab, Professor, ECE Department and BME Department.

Prerequisites by Topic:

- 1) ENG EC416: Introductory DSP
- 2) ENG EC381: Introductory Probability

Goals:

To provide students with the ability to:

- 1) Design and analyze a wide range of DSP algorithms.
- 2) Implement DSP algorithms in software.
- 3) Explore tradeoffs among different solution paths available in DSP.
- 4) Match DSP algorithms to application needs.
- 5) Comprehend journal articles on DSP and its applications.

Course Outcomes:

As an outcome of completing this course, students should be able to design DSP solutions involving the following topics:

1. Optimal FIR Filters
2. All-Pass and Minimum Phase systems.
3. Multi-Rate systems.
4. Phase Computation.
5. Fast DCT Computation.
6. Uniform Filterbanks: DFT & DCT Based.
7. Non-Uniform Filterbanks: Constant-Q & Wavelet Based.
8. Parametric Signal Modeling.
9. Cepstral Analysis.
10. Multi-Dimensional Transforms & Filters.

11. Speech Processing
12. Music Processing
13. Biomedical Signal Processing
14. Image Processing
15. Sensor Array Processing

Course Outcomes mapped to Program Outcomes:

Program:	a	b	c	d	e	f	g	h	i	j	k
Course:	1-15	11-13	1-9		1-9		1-15				1-15
Emphasis:	5	3	5		5		3				4

1=not at all; 5=a great deal;

Contribution of Course to Meeting the Professional Component:

Engineering topics: 100%

Math & Basic Science: 0%

General Education: 0%

Prepared by: S. Hamid Nawab, Prof.

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