Drexel University
Electrical and Computer Engineering Department

ECE-S 303 TRANSFORMS METHODS AND FILTERING

SYLLABUS

Instructor: Dr. Fernand Cohen [Bossone-410, Tel: 1420, fscohen@coe.drexel.edu]

TA's: Oday Bshara [Bossone-325, Tel: 6428, ob67@drexel.edu]

Office Hours:

Dr. Fernand Cohen	Thursday 11:15 pm - 12:15pm
Oday Bshara	Tuesday and Wednesday 2:00-3:00pm

Textbook: Charles L. Phillips & John M. Parr, *Signals, Systems and Transforms*, 4th edition, Prentice Hall, 2007.

Reference Texts:

1. John G. Proakis & Dimitris G. Manolakis, *Digital Signal Processing*, Prentice Hall, 1996 {Advanced}.
2. Alan V. Oppenheim & Ronald W. Schafer, *Discrete-Time Signal Processing*, Prentice Hall, 1989 {Advanced}.
3. Vinay K. Ingle & John G. Proakis, *Digital Signal Processing*, PWS Pun. Co., 1997.
4. James H. McClellan and et. al, *Computer-Based Exercises for Signal Processing using Matlab 5.*, Prentice Hall, 1998 {Advanced}.

Course Description:

This course covers the fundamentals of modeling signals and systems in the generalized Fourier transform domain (Laplace and Z-transforms). It also covers the fundamentals of the highly used discrete Fourier transforms (DFT) and its fast computation. It also covers sampling and quantization to fully discretize both the range and domain of continuous signals. Finally, it situates the Fourier transform within the general class of unitary transforms, a class of transforms that are widely used in signal compression and representation.

Homework:

Homework will be assigned during lecture periods and will be collected on Tuesdays; the solutions will be made available on the course web on Tuesdays after class. Homework assignments will be graded by the TA. All information about the course is on Learn.

In Class Quizzes and In-Term Exams:

There will be about 4 quizzes (20 to 25 min each on Thursdays at the end of recitatio/lecture), only the best 3 will be selected. There will be one midterm exam on the 5th week. **NO MAKE-UP QUIZZES WILL BE GIVEN. NO MAKE-UP EXAM WILL BE GIVEN WITHOUT PRIOR FORMAL EXCUSE** submitted to the Course Coordinator. Exceptions to this rule will be granted only highly unusual circumstances. The TA will grade the quizzes.

Final Exam:

The Final Exam will be a comprehensive two-hour test. The exam date will be announced.

Help-Sessions:

There will be review session prior to the midterm and final exams and mock exams will be available prior to the midterm and final exams.

Grading:

The course grade will be based on the performance quizzes, Midterm and the Final Exam. The course grade will be determined based on the following formulas:

Grade=Quizzes***0.25**+Midterm Exam***0.35**+Final***0.40**

TRANSFORM METHODS II: Generalized Fourier Transform – a unitary transform (3 CREDITS)

- Laplace Transform (LT):
  - Relationship to FT
  - ROC for causal, anticausal and noncausal signals
  - System Function Analysis

- Z-Transform:
  - Relationship to DTFT
  - ROC for causal, anticausal and noncausal finite and infinite duration sequences
  - Properties of Z-transform
  - Z-transform of some sequences
  - Discrete impulse response for sampled continuous systems
  - Z-transform and Laplace transform

- Sampling of continuous signals
  - Nyquist rate
  - Sampling of bandpass signals

- Signal quantization
  - Optimal quantizer
  - Uniform quantizer
  - Compandor quantizer

- Discrete Fourier Transform (DFT)
  - Sampling the DTFT
  - Relationship to FS
  - Inverse N-DFT
  - Parseval theorem
  - Circular and linear convolution
  - Fast Fourier Transform (FFT)

- Relationship between all transforms covered

- Unitary transforms – energy preserving