442mcd2018

# Master Course Description for EE-442 (ABET sheet)

**Title:** Digital Signals and Filtering

**Credits:** 3

## UW Course Catalog Description

**Coordinator:** Jenq-Neng Hwang, Professor, Electrical and Computer Engineering

**Goals:** To provide students with the fundamental knowledge of digital filter characteristics, design principles, and design specifications. Also to provide the opportunity for the students to actually design digital filters, FIR, IIR and adaptive filters, through the use of Matlab software to solve real world applications.

**Learning Objectives:** At the end of this course, students will be able to:

1. *Provide* students with the fundamental knowledge of digital filters
2. *Design* a digital filter with frequency specifications
3. *Design* a digital filter by various techniques and compare the tradeoffs.

**Textbook:** Vinay K. Ingle and John G. Proakis, *Digital Signal Processing using Matlab, 4th Ed.* Cengage Learning, Jan 1, 2016.

**Prerequisites by Topic:**

1. Discrete Time Signals and Linear Time Invariant Systems
2. Fourier Transform (continuous-time & discrete-time)
3. Laplace Transform
4. Z-Transform

**Topics:**

1. Review of Discrete-Time Fourier Transform (DTFT) and Z Transform
2. Review of Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)
3. Digital Filter Structures
4. Digital Finite Impulse Response (FIR) Filter Design
5. Digital Infinite Impulse Response (IIR) Filter Design
6. Adaptive Filter Design

**Course Structure:** The class meets for three 50-minute lectures a week. There are weekly homeworks that include some Matlab design projects as well as analytical derivations. The midterm and final exam are all written exams which consist of both analytical and programming questions.

**Computer Resources:** The course uses Matlab for all the design assignments. The recomended platforms are departmentalPCs with full suite of Matlab, including most toolboxes. It is also possible to use students' own personal computers with Matlab (the Matlab is available to students at academic discount from the University Book Store). The average student will require 6-8 hours of computer work per week.

**Laboratory Resources:** None

**Grading:** Weekly homework 24%, Midterm Exam 32%, Final Exam 44%

**ABET Student Outcome Coverage:** This course addresses the following outcomes:

H = high relevance, M = medium relevance, L = low relevance to course.

(1) *An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.* **(H)**

(2) *An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.* **(M)**

(3) *An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.* **(L)**

**Prepared by:** Jenq-Neng Hwang

**Last revised:** 6/21/2018