

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN  
Department of Electrical and Computer Engineering  
ECE 498MH SIGNAL AND IMAGE ANALYSIS

**Homework 5**  
Fall 2014

Assigned: Thursday, 2/16/2017

Due: Thursday, 2/23/2017

Reading: 1–40

Do **one** of the following two problems, and submit by 11:59pm 2/23/2017 (on Compass, if you don't hand it in during class). Homework will be handed back on 2/28/2017. If you don't like your grade, then you can hand in the **other** problem for a grade, no later than 3/7/2017.

**Problem 5.1**

A particular system computes the average of nine consecutive samples:

$$y[n] = \frac{1}{9} (x[n-4] + x[n-3] + x[n-2] + x[n-1] + x[n] + x[n+1] + x[n+2] + x[n+3] + x[n+4])$$

What is the impulse response,  $h[n]$ , of this system?

**Problem 5.2**

The third derivative of a signal,  $d^3x/dt^3$ , may be approximated by the following discrete-time system:

$$y[n] = -x[n-2] + 3x[n-1] - 3x[n] + x[n+1]$$

What is the impulse response of this system?