Homework Study Guide
ECE 637 Spring 2009

It is recommended that students work the problems listed below in order to prepare for exams. However these homework assignments are **not** required and will **not** be counted toward the final course grade. The problems are from previous exams, so they can be found on the archived web sites. Many (most) problems also have associated solutions, however, it is a good idea to try working the problems your self before reviewing the solutions.

Assignment 1 – due January 23 (Session 5)
- Topics: Continuous 1 and 2D Fourier Transform
  - Spring 2008 Exam 1: Problem 1 (CSFT)
  - Spring 2006 Exam 1: Problem 2 (CSFT)

Assignment 2 – due January 30 (Session 8)
- Topics: Tomography and MRI
  - Spring 2008 Exam 1: Problem 2, 3, 4 (tomography)
  - Spring 2008 Final: Problem 5 (MRI)
  - Spring 2007 Exam 1: Problem 3 (tomography)
  - Spring 2007 Final: Problem 2 (MRI)
  - Spring 2006 Exam 1: Problem 3 (MRI)
  - Spring 2006 Final: Problem 5 (tomography)
  - Spring 2005 Exam 1: Problem 2 (tomography)
  - Spring 2004 Final: Problem 1 (tomography)
  - Spring 2003 Exam 1: Problem 1 (tomography)
  - Spring 2002 Exam 1: Problem 2 (tomography)
  - Spring 2002 Exam 1: Problem 3 (MRI)
  - Spring 2001 Exam 1: Problem 4 (tomography)
  - Spring 2001 Final: Problem 5 (MRI)

Assignment 3 – due February 6 (Session 11)
- Topics: Discrete transforms; 1 and 2D Filters, sampling, and scanning
  - Spring 2008 Exam 2: Problem 3 (sampling)
  - Spring 2008 Final: Problem 1 (DSFT and DTFT)
  - Spring 2007 Exam 1: Problem 1, 2 (DSFT and 2D Z-transform)
  - Spring 2006 Exam 1: Problem 1 (discrete-time filtering)
  - Spring 2005 Exam 1: Problem 3 (DSFT and CSFT)
  - Spring 2005 Exam 2: Problem 2 (2D discrete-time filters)
  - Spring 2005 Final: Problem 4 (sampling)
  - Spring 2004 Final: Problem 3 (2D systems)
  - Spring 2003 Exam 1: Problem 2 (2D systems)
  - Spring 2002 Final: Problem 2 (video scanning and sampling)
  - Spring 2001 Exam 1: Problem 1 (2D FIR filtering)
  - Spring 2001 Exam 1: Problem 2 (2D IIR filtering)

Assignment 4 – due February 13
- Topics: Random processes, spectral estimation, and edge detection
  - Spring 2008 Exam 2: Problem 2 (power spectrum)
  - Spring 2007 Exam 2: Problem 3 (edge detection)
  - Spring 2007 Final: Problem 1 (power spectrum)
  - Spring 2006 Exam 2: Problem 3 (edge detection)
  - Spring 2005 Exam 1: Problem 1 (2D power spectrum and filtering)

Spring 2004 Midterm Exam: Problem 1 (2D AR processes)
Spring 2003 Exam 1: Problem 3 (power spectrum estimation)
Spring 2002 Exam 1: Problem 1 (power spectrum estimation)
Spring 2001 Exam 1: Problem 3 (power spectrum)

Assignment 5 – due February 18
Topics: Neighborhoods, connected components, and clustering
Spring 2005 Final: Problem 2 (connected component analysis)
Spring 2004 Midterm Exam: Problem 2 (connected components)
Spring 2003 Exam 2: Problem 1 (clustering)
Spring 2001 Exam 2: Problem 1 (clustering)

Assignment 6 – due February 27
Topics: Achromatic Vision, Gamma, and Visual MTF
Spring 2008 Final: Problem 3 (gamma correction)
Spring 2007 Exam 2: Problem 2 (contrast)
Spring 2005 Final: Problem 5 (gamma correction)
Spring 2004 Midterm Exam: Problem 4 (MTF and gamma correction)
Spring 2002 Exam 2: Problem 1 (image distortion metrics)
Spring 2001 Exam 2: Problem 2 (gamma correction)
Spring 2001 Final: Problem 4 (gamma correction)

Assignment 7 – due March 6
Topics: Color matching, additive and subtractive color
Spring 2008 Exam 2: Problem 1 (color and gamma)
Spring 2007 Exam 2: Problem 1 (color and gamma)
Spring 2006 Exam 2: Problem 2 (color matching)
Spring 2004 Final: Problem 4 (color matching)
Spring 2003 Exam 2: Problem 3 (subtractive color)

Assignment 8 – due March 13
Topics: Chromaticity and white point
Spring 2005 Exam 2: Problem 1 (chromaticity diagram)
Spring 2003 Exam 2: Problem 2 (chromaticity components)
Spring 2002 Exam 2: Problem 2 (chromaticity diagram)
Spring 2001 Exam 2: Problem 3 (chromaticity and white point)

Assignment 9 – due March 27
Topics: Color spaces, and perceptual uniformity
Spring 2006 Exam 2: Problem 1 (Lab space)
Spring 2006 Final: Problem 2 (color transformations)
Spring 2004 Midterm Exam: Problem 3 (perceptual uniformity)

Assignment 10 – due April 3
Topics: Interpolation, decimation, and optimum linear filtering
Spring 2007 Final: Problem 4 (inverse filtering)
Spring 2006 Final: Problem 3 (MMSE prediction)
Spring 2005 Exam 2: Problem 3 (MMSE prediction)
Spring 2004 Final: Problem 5 (MMSE prediction)
Spring 2002 Final: Problem 3 (2D interpolation)
Spring 2001 Final: Problem 2 (MMSE and MAE filtering)

Assignment 11 – due April 8

Topics: Nonlinear filtering
Spring 2007 Final: Problem 5 (nonlinear filtering)
Spring 2006 Final: Problem 4 (M-estimators)
Spring 2003 Final: Problem 1 (M-estimators)
Spring 2003 Final: Problem 4 (nonlinear image filtering)
Spring 2002 Final: Problem 4 (M-estimators)

Assignment 12 – due April 17
Topics: Digital Halftoning
Spring 2007 Final: Problem 3 (halftoning)
Spring 2006 Final: Problem 1 (halftoning)
Spring 2005 Final: Problem 3 (halftoning)
Spring 2004 Final: Problem 2 (halftoning/power spectrum)
Spring 2003 Final: Problem 2 (error diffusion)
Spring 2003 Final: Problem 5 (halftoning)
Spring 2002 Final: Problem 1 (error diffusion)
Spring 2001 Final: Problem 3 (halftoning)

Assignment 13 – due April 24
Topics: Entropy and lossless image coding
Spring 2008 Final: Problem 2 (entropy coding)
Spring 2005 Final: Problem 1 (lossless image coding)
Spring 2001 Final: Problem 1 (entropy coding)

Assignment 14 – due May 1
Topics: Lossy image source coding
Spring 2008 Final: Problem 4 (rate-distortion)