

Homework Study Guide

ECE 637 Spring 2011

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 by Session 5

Topics: Continuous 1 and 2D Fourier Transform
Spring 2009 Final: Problem 1 (CSFT and DTFT properties)
Spring 2008 Exam 1: Problem 1 (CSFT)
Spring 2006 Exam 1: Problem 2 (CSFT)

Assignment 2 – due by Session 8

Topics: Tomography and MRI
Spring 2010 Exam 1: Problem 2 (tomography)
Spring 2009 Exam 1: Problem 3 (tomography)
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 by Session 11

Topics: Discrete transforms; 1 and 2D Filters, sampling, and scanning
Spring 2010 Exam 2: Problem 3 (sampling)
Spring 2009 Exam 1: Problem 1 (FIR filters and frequency response)
Spring 2009 Exam 1: Problem 2 (sampling)
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 by Session 14

Topics: Random processes, spectral estimation, and eigen-image analysis
Spring 2010 Final: Problem 5 (power spectrum and MMSE prediction)
Spring 2010 Exam 1: Problem 3 (power spectrum and MMSE prediction)
Spring 2010 Exam 1: Problem 1 (power spectrum and IIR filters)
Spring 2009 Exam 2: Problem 1 (power spectrum)
Spring 2008 Exam 2: Problem 2 (power spectrum)
Spring 2007 Final: Problem 1 (power spectrum)
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 by Session 16

Topics: Neighborhoods, connected components, clustering, and edge detection
Spring 2010 Midterm 2: Problem 1 (edge detection)
Spring 2007 Exam 2: Problem 3 (edge detection)
Spring 2006 Exam 2: Problem 3 (edge detection)
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 by Session 20

Topics: Achromatic Vision, Gamma, and Visual MTF
Spring 2009 Exam 2: Problem 3 (gamma correction)
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 by Session 23

Topics: Color matching, additive and subtractive color
Spring 2010 Exam 2: Problem 2 (color and gamma)
Spring 2009 Final Exam: Problem 2 (color and gamma)
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 by Session 26

Topics: Chromaticity, white point, and quality metrics
Spring 2010 Final: Problem 2 (Lab color transform)
Spring 2010 Final: Problem 1 (chromaticity diagram)
Spring 2009 Exam 2: Problem 2 (chromaticity diagram)
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 by Session 29

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 by Session 32

Topics: Interpolation, decimation, and optimum linear filtering

Spring 2010 Final: Problem 4 (M-estimators and nonlinear filters)

Spring 2009 Final: Problem 4 (Training for MMSE and LS estimation)

Spring 2009 Final: Problem 3 (MMSE prediction)

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 by Session 34

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 by Session 38

Topics: Digital Halftoning

Spring 2010 Final: Problem 3 (quality metrics for halftoned images)

Spring 2009 Final: Problem 5 (error diffusion)

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 by Session 41

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 by Session 44

Topics: Lossy image source coding

Spring 2008 Final: Problem 4 (rate-distortion)