

Department of Electrical and Computer Engineering  
520.414 Image Processing and Analysis I  
Fall 2009

2009-2011 Catalog: The course covers fundamental methods for the processing and analysis of images and describes standard and modern techniques for the understanding of images by humans and computers. Topics include elements of visual perception, sampling and quantization, image transforms, image enhancement, color image processing, image restoration, image segmentation, and multiresolution image representation. Laboratory exercises demonstrate key aspects of the course. (3 credit hours/Elective)

Prerequisite(s): 520.214 Signals and Systems

Textbook: R. C. Gonzalez and R. E. Woods, *Digital Image Processing*, Third Edition. Prentice-Hall, Upper Saddle River, New Jersey, 2008.

Course Objectives: This class is about techniques for the automatic processing and analysis of images by computers. We begin with an introduction to the human visual system and visual perception. We then make the connection to image processing and analysis. We study systems for processing continuous and discrete images both in the spacial and Fourier domains. We show how to discretize continuous images in order to put them in a form more appropriate for computers. We then study basic image processing techniques: image enhancement, image restoration, edge detection, and image thresholding. Color images are also considered. Finally, the concept of multiresolution image representation, and its use for image compression, is discussed. The main objective of this course is to provide a comprehensive presentation of the fundamentals of image processing and analysis both from a theoretical as well as practical point of view.

Topics Covered:

1. Mathematical representation of images
2. Continuous and discrete image processors
3. Separable image transforms
4. Image enhancement
5. Spatial filtering
6. Frequency filtering
7. Color image processing
8. Image restoration
9. Image segmentation
10. Multi-resolution image representation
11. Pyramid Decompositions
12. Wavelet Decompositions

Class Schedule: Two – one and one-quarter hour classes/weekly

Contribution of Course to Meeting the Professional Component (credit hours):

<b>Engineering Science</b>	<b>Engineering Science and Design</b>
3	

Relationship of Course to Program Educational Outcomes ( those that apply):

<input checked="" type="checkbox"/>	Apply mathematics, probability and statistics, basic science, and computer science
	Design and conduct experiments, analyze and interpret data
<input checked="" type="checkbox"/>	Identify, formulate and solve electrical engineering problems
	Use technical skills and modern engineering tools to design to meet needs
	Communicate effectively and work on multidisciplinary teams
	Contemporary issues, ethical responsibilities, environmental, health, safety issues
	Engage in life-long learning

Updated April 1, 2009 by: John I. Goutsias