

EK131-132 E4 Description

Subsurface Sensing and Imaging

Catalog Copy

Fall 2009

Prof. M. Ruane

How can engineers detect and image objects that are hidden, e.g. underground or underwater, within a package, or embedded in the human body? Probes and sensors yield complicated data, from which we must extract information about the hidden objects. In this module, you will learn the basic ideas behind probing hidden targets using various kinds of waves. You will learn the basic principles of major current imaging techniques and be introduced to the concept of modeling. You will use MATLAB to examine and manipulate images, and LabVIEW to control various imaging stations in the CenSSIS (Center for Subsurface Sensing and Imaging Systems) 'High Tech Tools and Toys Lab'. 2.0 credits

Professor Michael Ruane	TR	3:30-5 pm	Enroll Limit: 20	Location: PHO 209 lab
Lab session required	TBA	TBA	<10/session	PHO209 lab

Schedule

<i>Mtg</i>	<i>EK131</i>	<i>EK132</i>	<i>Description of the day's problem</i>
1	Sep 3	Oct 22	What are examples of 'hidden worlds' with subsurface sensing and imaging?
2	Sep 8	Oct 27	How do we define an image?
3	Sep 10	Oct 29	How do we sense and store an image?
Lab 1			Getting, displaying, sizing images
4	Sep 15	Nov 3	How do we quantify an image?
5	Sep 17	Nov 5	How can we control an imaging system?
Lab 2			Histograms, statistics of images, sub images
6	Sep 22	Nov 10	How do we modify an image?
7	Sep 24	Nov 12	How do we deal with noise in images?
Lab 3			Filtering, thresholding
8	Sep 29	Nov 17	How do we design imaging/sensing/computer systems? LabVIEW
9	Oct 01	Nov 19	How do engineers follow an ethical path – mine dispersal, mine detection?
Lab 4			Noise generation
10	Oct 6	Nov 24	How do we build a magnetic sensor?
11	Oct 8	Dec 1	How do we build a tracking application? Project?
Lab 5			Applications
12	Oct 15	Dec 3	How do we build a counting application? Project?
13	Oct 20	Dec 9	How can you pursue imaging further at CenSSIS and BU?

See <http://blackboard.bu.edu> for online class information.

No textbook is required. No lab kit is needed.

EK131-132 E4 Description

Subsurface Sensing and Imaging

Fall 2009

Prof. M. Ruane

Course Objectives

- To develop problem solving and design skills.
- To develop understanding of digital images
- To develop familiarity with hardware components for imaging
- To develop proficiency with imaging software tools
- To develop familiarity with engineering ethics codes
- To improve technical communication skills
- To understand the role of imaging in modern society

Assessment

- Quizzes – mastery of key class ideas (Friday makeup; max score kept)
- Homework – mastery of skills developed in classes
- Labs - development of solution strategies and software
- Class participation

Assignment Schedule (tentative, Fall 2009)

<i>Mtg</i>	<i>EK131</i>	<i>EK132</i>	<i>QZ</i>	<i>HW Due Friday</i>
1	Sep 3	Oct 22		
2	Sep 8	Oct 27		
3	Sep 10	Oct 29	1	
4	Sep 15	Nov 3		1
5	Sep 17	Nov 5	2	
6	Sep 22	Nov 10		2
7	Sep 24	Nov 12	3	
8	Sep 29	Nov 17		3
9	Oct 1	Nov 19	4	
10	Oct 6	Nov 24		4
11	Oct 8	Dec 1	5	
12	Oct 15	Dec 3		5
13	Oct 20	Dec 8		

Contact Information

Prof. Michael Ruane , mfr@bu.edu	Sara Grier, sgrier@bu.edu (GTF)
Electrical & Computer Engineering, Boston University	Electrical & Computer Engineering, Boston University
8 St. Mary's Street, Boston, MA 02215-2403	8 St. Mary's Street, Boston, MA 02215-2403
617-353-3256 617-835-6780 cell	
Office Hours Fall 2009: T 11-12; W 3-4; F 10-11	