ECE 5460 (Proposed): Image Processing

Course Description

Fundamentals and research directions in image processing: cameras, geometry, calibration, 2D and 3D image reconstruction, stereo, structure from motion, Radiometry, filtering, motion estimation, and applications.

Prior Course Number: 707
Transcript Abbreviation: Image Processing
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5200 (600), and Stat 3470 (427) or Math 530; or Grad standing in Engineering, Biological Sciences, Statistics, Bioinformatics, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 707.
Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Learn the mathematical underpinnings of digital image processing
Learn to design systems for image restoration, 3D model reconstruction, how to interpret and modify the radiometry parameters of an image, image filtering, and motion analysis
Learn to develop image processing solutions through computer projects and real image experiments, documented with written reports

Develop an image processing system to meet a broad set of design specifications, working in teams, and presenting the results in formal reports

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Camera Models	4.5							
Camera Calibration	3.0							
Geometry of Multiple Views and Stereo	4.5							
Structure from Motion	6.0							
Radiometry, Shadows and Shading	6.0							
Introduction to Optical Flow and Segmentation	6.0							
Linear filters, edge detection and compression	3.0							
Computer projects	3.0							

Grades

Aspect	Percent
Homework	25%
Individual projects and/or midterm exams and quizzes	35%
Final project and/or final exam	40%

Representative Textbooks and Other Course Materials

Title	Author
Computer Vision: A Modern Approach, 2nd ed., Prentice-Hall, ISBN: 978-0136085928	Forsyth and Ponce

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Updated prereqs, exclusions, goals and topics to match university format 3/20/12
Updated text to 2nd edition, 6/6/13. CED.

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