Cover Sheet: Request 10593

EEL4402 Computational Photography

Info

11110	
Process	Course New Ugrad/Pro
Status	Pending
Submitter	Edvardsson, Laurie laurie@ece.ufl.edu
Created	12/3/2015 9:28:50 AM
Updated	1/21/2016 10:49:42 AM
Description	New technical elective

Actions

Step	Status	Group	User	Comment	Updated					
Department	Approved	ENG -	Fox, Robert M		12/3/2015					
		Electrical and								
		Computer								
		Engineering								
		011905000								
No document changes										
College	Approved	ENG - College	Caple,		1/21/2016					
		of Engineering	Elizabeth							
Replaced 4402 - Computa Photo - ucc1 syl.docx1/6/										
Added 4402 -	Added 4402 - Computa Photo - ucc1 syl.docx									
University	Pending	PV - University			1/21/2016					
Curriculum		Curriculum								
Committee		Committee								
		UCC)								
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College										
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No document changes										

Course|New for request 10593

Info

Request: EEL4402 Computational Photography **Submitter:** Edvardsson, Laurie laurie@ece.ufl.edu **Created:** 12/3/2015 9:29:02 AM **Form version:** 2

Responses

Recommended Prefix: EEL Course Level: 4 Number: 402 Lab Code : None **Course Title:** Computational Photography Transcript Title: Computat Photography Effective Term : Fall Effective Year: 2016 Rotating Topic?: No Amount of Credit: 3 Repeatable Credit?: No S/U Only?: No Contact Type : Regularly Scheduled Degree Type: Graduate Weekly Contact Hours: 003 **Category of Instruction :** Joint (Ugrad/Grad) **Delivery Method(s):** On-Campus **Course Description :** Fundamentals of computational photography, sensing, imaging and illumination. Prerequisites : EEL 3135(C) **Co-requisites :** None Rationale and Placement in Curriculum : This technical elective introduces the student to the area of imaging, sensors, and cameras.

Course Objectives : The student will be able to demonstrate the basics of computational photography as it relates to applications in computer vision, graphics and imaging. The student will be able to explain how models of light from radiometry and optics can be used to understand scene information from images, build novel sensors and create new photographs; the intersection between computing and light, a "camera culture" perspective of technology, professionally use sensors and cameras. The student will be able to create new photographs.

Course Textbook(s) and/or Other Assigned Reading: a. Title: Robot Vision

- b. Author: B. K. P. Horn
- c. Publication date and edition: MIT Press 1986
- d. ISBN number: 0262081598
- a. Title: Multiple View Geometry in Computer Vision
- b. Author: Richard Hartley and Andrew Zisserman
- c. Publication date, edition, and company: Cambridge
- d. ISBN number: 9780521540513

Weekly Schedule of Topics : Week 1:

Lec 1: History of cameras, sensors and light

Lec 2: Camera culture and computational photography

Lec 3: Pixels, Video and Art

Week 2:

Lec 4: Reflectance: basic principles

Lec 5: Image processing Week 3: Lec 6: Reflectance: algorithms and measurements Lec 7: Camera calibration Lec 8: Image Warping and morphing Week 4: Lec 9: Lighting and shadows Lec 10: Programmable imaging Lec 11: Human head rendering Week 5: Lec 12: Interreflections Lec 13: Structured light Lec 14: Image pyramids, retargeting and fusing images Week 6: Lec 15: Reflection and refraction Lec 16: Superresolution Lec 17: Mosaicing images Week 7: Lec 18: Caustics of cameras and reflections Lec 19: Flutter shutter and temporal coding Week 8: Lec 20: Light polarization Lec 21: Camera arrays - 1 Lec 22: Optical flow and motion Week 9: Lec 23: Basic principles of scattering Lec 24: Camera arrays - 2 Lec 25: Spatial textures Week 10: Lec 26: Advanced scattering in vision and graphics Lec 27: Catadioptric cameras Lec 28: Temporal textures Week 11: Lec 29: Modeling fluids Lec 30: Stereo with planar mirrors Lec 31: Create digital mattes Week 12: Lec 32: Optical processing with diffraction Lec 33: Deblurring Lec 34: HDR images Week 13: Lec 35: Interference and angle sensitive pixels Lec 36: Polarization imaging Lec 37: Geometry from a single image Week 14: Lec 38: High-speed flash photography Week 15: Lec 39: Photo tourism Lec 40: Image-based rendering Lec 41: Transient imaging Week 16: Lec 42: Presentations Lec 43: Presentations Grading Scheme : 20% Participation 15% Presentations 30% Midterm 35% Final

Note: This course is co-listed with the graduate class. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

Instructor(s) : Dr. Sanjeev J. Koppal

EEL 4402 Computational Photography

- 1. Catalog Description (3 credits) Fundamentals of computational photography, sensing, imaging and illumination.
- 2. Pre-requisites EEL 3135
- 3. Course Objectives The student will be able to demonstrate the basics of computational photography as it relates to applications in computer vision, graphics and imaging. The student will be able to explain how models of light from radiometry and optics can be used to understand scene information from images, build novel sensors and create new photographs; the intersection between computing and light, a "camera culture" perspective of technology, professionally use sensors and cameras. The student will be able to create new photographs.
- 4. Contribution of course to meeting the professional component (ABET only undergraduate courses) 1.5 hours of Engineering Science, 1.5 hours of Engineering Design
- 5. Relationship of course to program outcomes: Skills student will develop in this course (ABET only undergraduate courses) EE3, a, c
- 6. Instructor Dr. Sanjeev J. Koppal
 - a. Office location: 437 NEB
 - b. Telephone: 352-392-8942
 - c. E-mail address: sikoppal@ece.ufl.edu
 - d. Class Web site: <u>https://www.ece.ufl.edu/users/koppal-sanjeev-j</u>
 - e. Office hours: 1:00 p.m. 2:00 p.m., Fridays
- 7. Teaching Assistant None
- 8. Meeting Times and Location Monday, Wednesday, Friday, 5th period (11:45 a.m. 12:35 p.m., 330 Larsen
- 9. Class/laboratory schedule 3 class periods each week consisting of 50 minutes each
- 10. Material and Supply Fees None
- 11. Textbooks and Software Required Published research articles provided by instructor
- 12. Recommended Reading
 - a. Title: Robot Vision
 - b. Author: B. K. P. Horn
 - c. Publication date and edition: MIT Press 1986
 - d. ISBN number: 0262081598
 - a. Title: Multiple View Geometry in Computer Vision

b. Author: Richard Hartley and Andrew Zisserman

c. Publication date, edition, and company: Cambridge

d. ISBN number: 9780521540513

13. Course Outline -

Week 1:

Lec 1: History of cameras, sensors and light

Lec 2: Camera culture and computational photography

Lec 3: Pixels, Video and Art

Week 2:

Lec 4: Reflectance: basic principles

Lec 5: Image processing

Week 3:

Lec 6: Reflectance: algorithms and measurements

Lec 7: Camera calibration

Lec 8: Image Warping and morphing

Week 4:

Lec 9: Lighting and shadows

Lec 10: Programmable imaging

Lec 11: Human head rendering

Week 5:

Lec 12: Interreflections

Lec 13: Structured light

Lec 14: Image pyramids, retargeting and fusing images

Week 6:

Lec 15: Reflection and refraction

Lec 16: Superresolution

Lec 17: Mosaicing images

Week 7:

Lec 18: Caustics of cameras and reflections

Lec 19: Flutter shutter and temporal coding

Week 8:

Lec 20: Light polarization

Lec 21: Camera arrays - 1

Lec 22: Optical flow and motion

Week 9:

Lec 23: Basic principles of scattering

Lec 24: Camera arrays - 2

Lec 25: Spatial textures

Week 10:

Lec 26: Advanced scattering in vision and graphics

Lec 27: Catadioptric cameras

Lec 28: Temporal textures

Week 11:

Lec 29: Modeling fluids

Lec 30: Stereo with planar mirrors

Lec 31: Create digital mattes Week 12: Lec 32: Optical processing with diffraction Lec 33: Deblurring Lec 34: HDR images Week 13: Lec 35: Interference and angle sensitive pixels Lec 36: Polarization imaging Lec 37: Geometry from a single image Week 14: Lec 38: High-speed flash photography Week 15: Lec 39: Photo tourism Lec 40: Image-based rendering Lec 41: Transient imaging Week 16: Lec 42: Presentations Lec 43: Presentations

14. Attendance and Expectations - Cell phones and other electronic devices are to be silenced. No text messaging during class or exams.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <u>https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx</u>

15. Grading -

25% Presentations35% Midterm40% Final

Note: This course is co-listed with the graduate class. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

16. Grading Scale -

A	A-	B+	В	B-	C+	C	C-	D+	D	D-	E
90-100	85-89	80-84	75-79	65-74	60-64	55-59	50-54	45-49	40-44	35-39	0-34

"A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better)." Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <u>https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx</u>

17. Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at: <u>https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx</u>

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

- 18. Honesty Policy UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.
- 19. Accommodation for Students with Disabilities Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.
- 20. UF Counseling Services Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
 - UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: <u>http://www.counseling.ufl.edu/cwc/Default.aspx</u>,
 - Career Resource Center, Reitz Union, career and job search services, 392-1601.
 - University Police Department, 392-1111 or 911 for emergencies
- 21. Software Use All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.
- 22. Course Evaluation Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: https://evaluations.ufl.edu/results.