Course number: EEE/AME 598 (Spring 2018)
Title: Computational Cameras, Lighting, and Displays
Instructor: Suren Jayasuriya, (sjayasur (at) asu.edu)

Course Objectives and Expected Learning Outcomes

This course will survey the evolution of camera design and focus on recent research in computational cameras, illumination systems, 3D scanners, and displays. Starting with the basics of traditional photography and the imaging pipeline, the course will proceed to explore new ways to capture visual information by co-designing camera hardware and software algorithms. Topics covered include light field photography, compressive sensing and single-pixel cameras, light transport and programmable illumination, LIDAR, and computational displays for virtual/augmented reality. The class will focus on understanding and evaluating new imaging technology for specific applications including autonomous vehicles, entertainment and graphics, computer vision and visual recognition, and robotics.

Textbook/Readings

The course will have no assigned textbook, but will utilize material from recent research papers in the field. Several supplementary texts and papers will be provided for additional reading.

Pre-requisites

The prerequisites for this class include prior programming experience in a high level language like MATLAB or Python and basic knowledge of calculus, linear algebra, and signal processing, however, interested students (including AME students) should still contact the instructor even without these to discuss.

Grade Policies

The course will feature 5-6 assignments that involve both written and programming questions, and a final project. In addition, in-class quizzes and class participation will be assessed for a portion of the grade. The projects are planned to be group projects, where you will be encouraged to clearly define a problem statement, propose a novel solution, and design an implementation.

Attendance Policy

Students are expected to attend all classes. Unexcused absences beyond three will result in a reduction in the student's final grade by one letter grade for every two absences. Tardiness over 10 minutes will be considered an unexcused absence. Attendance will be taken every class, starting the second week of class to allow for new students. If you anticipate having a problem attending class for whatever reason, you are urged to contact the instructor in advance of your expected absence. Absences beyond 6 classes without informing the instructor would result in you being dropped from the course according to ASU rules.

Office Hours

Suren Jayasuriya – TBA and by appointment, please contact us via email to set up appointments in advance.

Academic Dishonesty

All necessary and appropriate sanctions will be issued to all parties involved with plagiarizing any and all course work. Plagiarism and any other form of academic dishonesty that is in violation with the Student Code of Conduct will not be tolerated. For more information, please see the ASU Student Academic Integrity Policy.

Special Accommodations

To request academic accommodations due to a disability; please contact the ASU Disability Resource Center (http://www.asu.edu/studentaffairs/ed/drc/# ; Phone: (480) 965-1234; TDD: (480) 965-9000). This is a very important step as accommodations may be difficult to make retroactively. If you have a letter from their office indicating that you have a disability which requires academic accommodations, in order to assure that you receive your accommodations in a timely manner, please present this documentation to me no later than the end of the first week of the semester so that your needs can be addressed effectively.

Tentative list of Topics:

Date	Topic
1/8/18	Intro; Basics of Cameras
1/15/18	Optics, Lenses, Sensors
1/22/18	Digital Image Processing
1/29/18	Burst Photography: HDR, low-light imaging, super-resolution
2/5/18	Light Field Photography
2/12/18	Coded Computational Imaging: spatially and temporally
2/19/18	Projectors and Computational Illumination
2/26/18	Depth mapping: Computer Vision Techniques
3/5/18	Spring Break
3/12/18	Time-of-Flight and LIDAR Imaging
3/19/18	Physics-based Vision
3/26/18	Computational Cameras + Deep Learning
4/2/18	Display Technology
4/9/18	Augmented and Virtual Reality
4/16/18	Computational Displays for VR/AR
4/23/18	Final Project Presentations