ELEG 404/604 - Digital Imaging and Photography

Credits: 3, Section(s): 010
Semester: Spring, Year: 2021
Meeting Days, Times, Location and Room:
Lecture: Tuesday and Thursday, 2:00PM - 3:15PM
Zoom Link: To be sent

Table of Contents

1. Instructor Information

Instructor Contact Information

Instructor name: Gonzalo R. Arce
Instructor preferred pronouns: he/him/his
Email address: arce@udel.edu
Office location: 312 Evans Hall
Office hours: By appointment

Teaching Assistant(s) Contact Information

TA name:
E-mail address:
Office location:
Office hours:
Additional information:

2. Course Description

Description

This course deals with the analysis and processing of digital images as well as an introduction to the scientific and computational aspects of digital photography. Sensors capturing energy across the electromagnetic spectrum provide a rich gamut of images that can be processed digitally for a myriad of applications including medical, surveillance, remote sensing, and consumer electronics. This course provides the fundamentals mathematical tools for image analysis covering topics in sampling, perception, color, Fourier analysis and restoration, computed tomography, compression, lenses, optics and computational photography.

Prerequisites

Prerequisites: ELEG 305 or equivalent, a first course in linear algebra, and basic knowledge in programming.

Course Delivery

Online Synchronous

3. Learning Outcomes

At the conclusion of this course, you should have learned about:

1. Image formation
2. Image enhancement
3. Fourier analysis
4. Image sampling, noise, aliasing and interpolation
5. Perception and retina display
6. CMOS sensors and color arrays
7. The 2D Discrete Fourier Transform, 2D spectral filtering

8. X-Ray tomography
9. Color image processing
10. Neural networks and classification
11. Image compression and JPEG (if time permits)

4. Learning Resources

Required Learning Materials

Textbook 1: Digital Image Processing, 4th ed. R. Gonzalez, and R. Woods. Prentice Hall.

Lecture slides available at https://www.eecis.udel.edu/~arce/ courses/digitalimgproc/

Technology

Canvas: In this class, Canvas, UD's online learning management system, will be used for all course activities and communication channels. All assignments will be posted through the Canvas course site unless otherwise directed.

Information on how to use Canvas is available through the Canvas Student Guide.

Canvas can also be accessed via MyUD.

Zoom: In this class, Zoom will be used for video conferencing. You will receive a meeting invitation with a specific web link and meeting ID number for use in this class.

Zoom is a web-based application that can be used from a computer, tablet, or phone. From a computer, click the class web link and be sure to install the small program that will download to your computer. You only need to install the program once. From a mobile device, download the free Zoom app and type in the class meeting ID number.

A microphone and camera are recommended for online meetings. Information on how to test your computer's audio and video can be found on Zoom's website. Learn more info about Zoom at UD.

We will be using MATLAB in this class for homework.

5. Learning Assessment

Final Grade Breakdown

The final course grade will be calculated using the following components:

Course Component	Percentage of Total

Homework	20%
Midterm 1	25%
Midterm 2	25%
Final Exam	30%

7. Course Policy Document

Course Specific Policies

All re-grade requests must be submitted within one week after the assignment or exam was returned.

Attendance

Students are expected to attend all their scheduled classes and laboratories and not to be absent without adequate reason. Further information may be found at **UD's attendance policy.** Absences from graded activities need to be approved by the primary instructor beforehand, or with appropriate documentation to the instructor for urgent health, personal, or family matters.

Absences on religious holidays listed in university calendars are recognized as an excused absence. Nevertheless, students are urged to remind the instructor of their intention to be absent on a particular upcoming holiday. Absences on religious holidays not listed in university calendars, as well as absences due to athletic participation or other extracurricular activities in which students are official representatives of the university, shall be recognized as excused absences when the student informs the instructor in writing during the first two weeks of the semester of these planned absences for the semester.

Communication

Course announcements will be posted using Canvas.

Please use Piazza (integrated into the Canvas website) for questions regarding course content and homework. This will provide a quicker response since all instructional staff will be monitoring Piazza. It will also allow classmates to offer a response if appropriate and will let the entire class to benefit from the question. For other issues, if you email instructors directly, be sure to include "ELEG 205" in the subject line

UD Policies

Academic Integrity

Please familiarize yourself with UD policies regarding academic dishonesty. To falsify the results of one's research, to steal the words or ideas of another, to cheat on an assignment, to re-submit the same assignment for different classes, or to allow or assist another to commit these acts corrupts the educational process. Students are expected to do their own work and neither give nor receive unauthorized assistance. Complete details of the university's academic integrity policies and procedures can be found at sites.udel.edu/studentconduct/sgup/ Office of Student Conduct, 218 Hullihen Hall, (302) 831-2117. E-mail: student-conduct@udel.edu

Harassment and Discrimination

The University of Delaware works to promote an academic and work environment that is free from all forms of discrimination, including harassment. As a member of the community, your rights, resource and responsibilities are

reflected in the non-discrimination and sexual misconduct policies. Please familiarize yourself with these policies at www.udel.edu/oei . You can report any concerns to the University's Office of Equity & Inclusion, at 305 Hullihen Hall, (302) 831-8063 or you can report anonymously through UD Police (302) 831-2222 or the EthicsPoint Compliance Hotline at www1.udel.edu/compliance. You can also report any violation of UD policy on harassment, discrimination, or abuse of any person at this site: sites.udel.edu/sexualmisconduct/how-to-report/

Faculty Statement on Disclosures of Instances of Sexual Misconduct

If, at any time during this course, I happen to be made aware that a student may have been the victim of sexual misconduct (including sexual harassment, sexual violence, domestic/dating violence, or stalking), I am obligated by federal law to inform the university's Title IX Coordinator. The university needs to know information about such incidents to, not only offer resources, but to ensure a safe campus environment. The Title IX Coordinator will decide if the incident should be examined further. If such a situation is disclosed to me in class, in a paper assignment, or in office hours, I promise to protect your privacy--I will not disclose the incident to anyone but the Title IX Coordinator.

For more information on Sexual Misconduct policies, where to get help, and reporting information, please refer to www.udel.edu/sexualmisconduct. At UD, we provide 24/7/365 crisis assistance and victim advocacy and counseling. Contact 302-831-1001 to get in touch with a sexual offense support advocate, as well as confidential and anonymous counseling services for other concerns.

Accommodations for Students with Disabilities

Any student who thinks he/she may need an accommodation based on a disability should contact the Office of Disability Support Services (DSS) office as soon as possible. Students who have documentation of their need for accommodation should register via the SAM platform: andes.accessiblelearning.com/UDEL/. Reach DSS in the following ways: Phone: 302-831-4643, fax: 302-831-3261, DSS website. Email: dssoffice@udel.edu or visit at 240 Academy Street, Alison Hall Suite 130.
During COVID-19, Disability Support Services staff are available remotely. Please call 302-831-4643 during business hours (8-5 M-F) or email dssoffice@udel.edu for assistance.

Non-Discrimination

The University of Delaware does not discriminate against any person on the basis of race, color, national origin, sex, gender identity or expression, sexual orientation, genetic information, marital status, disability, religion, age, veteran status or any other characteristic protected by applicable law in its employment, educational programs and activities, admissions policies, and scholarship and loan programs as required by Title IX of the Educational Amendments of 1972, the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, Title VII of the Civil Rights Act of 1964, and other applicable statutes and University policies. The University of Delaware also prohibits unlawful harassment including sexual harassment and sexual violence.

For inquiries or complaints related to non-discrimination policies, please contact: Office of Equity & Inclusion-oei@udel.edu, 305 Hullihen Hall Newark, DE 19716 (302) 831-8063

For complaints related to Section 504 of the Rehabilitation Act of 1973 and/or the Americans with Disabilities Act, please contact: Office of Disability Support Services, dssoffice@udel.edu, Alison Hall, Suite 130, Newark, DE 19716 (302) 831-4643 OR contact the U.S. Department of Education - Office for Civil Rights