Digital Image Processing

EECE 694

Instructor Info

Dr. Roula Nassif

Bechtel 431

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Office Hrs: Tuesday & Thursday 05:00-06:15pm (Zoom meetings will be scheduled upon request)

Course Info

Prereq: Senior standing

T-R

03:30–04:45pm

Ray Irani Oxy Eng'g Complex 518/Webex Meetings

The course web page will be available on Moodle

Overview

This course covers a wide array of topics, including multi-dimensional signal processing; digital image fundamentals; image formation and perception; image representation and coding; linear image filtering and correlation; image enhancement in the spatial and frequency domains; image restoration; color image processing; wavelet and multi-resolution processing; image compression; morphological image processing; noise reduction and restoration; image segmentation; feature extraction and recognition tasks; and introduction to computer graphics and computer vision. Emphasis is on the general principles of image processing. Students learn to apply material by implementing and investigating image processing algorithms in Matlab. Students will complete a term project.

Material

Textbook

R. C. Gonzalez and R. E. Woods, *Digital Image Processing*, 4th Edition, Pearson, 2018.

Reference Texts

D. E. Dudgeon and R. M. Mersereau, *Multidimensional Digital Signal Processing*, Prentice-Hall, 1984.
W. K. Pratt, *Digital Image Processing*, 3rd Edition, John Wiley, 2001.
K. R. Castleman, *Digital Image Processing*, Prentice Hall, 1996.
A. N. Netravali and B. G. Haskell, *Digital Pictures*, Plenum, 2e,1995.

Other

Students are responsible for all material posted on the course webpage. It is the students' responsibility to check the webpage frequently for any announcements regarding Homework and Project due dates, as well as scheduling of exams (or possible changes in dates).

Grading Scheme (Tentative)

25%	Problem Sets & Participation
25%	Project
50%	Midterm & Final Exams

Lectures (Live and recorded)

All live lectures begin on the hour. Class participation is encouraged. Lectures and other course material will be posted on the course webpage. Recorded lectures will be accessed through the course webpage. The recordings are intended for *exclusive* use by students currently enrolled in the course and are to be considered confidential. No recorded lecture may be shared (e.g., copied, displayed, broadcast, or published) with any individual within or outside AUB without prior written permission from the lecturer and without giving proper attribution. This prohibition includes placing the recording on any web page for use by, or access to, any person, including the student. Misuse of recordings will be considered as unprofessional behavior and appropriate disciplinary action will be taken.

Problem Sets

Assignments must be submitted *on time* through *Moodle*. Submissions by email will not be accepted under any circumstance without a valid excuse. You are expected to do all the assigned problems. Problem set solutions will be available electronically (through Moodle) at the end of the due date. Consequently, it is difficult and unfair to seriously evaluate late problem sets. Any missed submissions will result in zero credit for the corresponding homework.

Course objectives

- *Objective 1:* Develop an overview of the field of image processing.
- *Objective 2:* Understand the fundamental algorithms and how to implement them.
- *Objective 3:* Gain experience in applying image processing algorithms to real problems.
- *Objective 4:* Learn practical skills and analytic background for building digital image/multimedia applications.

Course Topics

- *Topic 1:* Introduction to Digital Image Processing
- *Topic 2:* Digital Image Fundamentals
- *Topic 3:* Image Enhancement in the Spatial Domain
- *Topic 4:* Image Enhancement in the Frequency Domain
- *Topic 5:* Image Restoration
- *Topic 6:* Color Image Processing
- *Topic 7:* Wavelet and Other Image Transforms
- *Topic 8:* Image Compression
- *Topic 9:* Morphological Image Processing
- *Topic 10:* Image Segmentation
- *Topic 11:* Representation and Description
- *Topic 12:* Object Recognition
- *Topic 13:* Introduction to Computer Vision

Make-up Exam Policy

Students who miss an exam for documented medical reasons may sit for a make-up exam that will be scheduled at the end of the term.

Academic Integrity

The University Code of Academic Integrity is central to the ideals of this course. Students are expected to be familiar with the Code. Cheating in any of its forms (including presenting work found on the Internet as your own) will not be tolerated. Students who cheat or help other students to cheat will receive a grade of zero on the assignment, project, or exam in question. They will also be subject to other disciplinary action as deemed necessary.

Course Policy

The course policy will be updated as deemed necessary during the semester. Students are required to abide by the rules of the course. Students who do not respect the course policy will be subject to disciplinary action.

Students with Special Needs

AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you are encouraged to contact the Accessible Education Office: accessibility@aub.edu.lb, +961-1-350000, x3246; West Hall, 314.