**IMAGE PROCESSING – TEL519E**
**Course Syllabus**

**Instructor:** Assoc. Prof. Ender M. Ekşioğlu, eksioglue at itu.edu.tr, Office: 2401

**Lecture hours**: Thursday, 13:30-16:30, Room 2405
**Office hours:** Thursday 10:00-12:00
**Webpage:** ninova, dropbox
**Prerequisite:** A good background in calculus, linear algebra, statistics, signal processing, programming in MATLAB.

**Textbook:**
"*Digital Image Processing*", Rafael C. Gonzales and Richard E. Woods, 3rd Edition, Prentice Hall, 2008. Class notes are available.
**Some reference texts**:
"*Fundamentals of Digital Image Processing*", Chris Solomon and Toby Breckon, Wiley-Blackwell, 2010.
"*Digital Image Processing Using MATLAB*", Rafael C. Gonzales, Richard E. Woods, and Steven L. Eddins, 2nd Edition, Gatesmark Publishing, 2009.
**Course Objectives:**
This course deals with the theories and applications of image processing in terms of acquisition, representation, storage, transmission, and understanding of digital image. Topics to be covered include: image acquisition and digital image representation, image enhancement, image restoration, image compression, image segmentation, morphological image processing, color image processing (and if time permits multiresolution image processing, object recognition, and other special topics).

**Homework:** A due date will accompany each homework assignment. The due time of the homework will be at the beginning of the class. You will be neither excused from nor granted any extension for an assignment without prior approval from the instructor. Late homework may be accepted with 30% credit loss for each late day. Lectures, assignments and solutions will be posted on the class website in ninova.

**Academic Integrity:** Homework and examinations are expected to be the sole effort of the student submitting the work. Students found guilty of cheating will receive a zero grade for the concerning homework, report or exam.
**Attendance:** Attendance is required for at least 2/3 of the course hours, i.e. for at least 10 class sessions.

| **Grading criteria:** | **Percent of final grade** |
|---|---|
| Homework and Quizzes: | 20% |
| Midterm Exam: | 20% |
| Term project: | 30% |
| Final exam (cumulative): | 30% |

## Course Outline

| Date | Text | Topics |
|---|---|---|
| 9/11-9/18 | Chap 1, Chap 2. | Introduction to Digital Image Processing (DIP), Human visual system and Visual Psychophysics, DIP with MATLAB |
| 9/25 | Chap 2, Chap 6.1-6.2 | Project topic finalization. Image acquisition, camera, sampling theory, image resizing, color fundamentals, color models |
| 10/2 | Chap 3.1-3.3 | Project proposal due. Pixel operations, histogram processing, contrast and brightness adjustment |
| 10/9 | Chap 3.4 - 3.7, | arithmetic/logic operation, spatial filtering, contrast enhancement, edge sharpening |
| 10/16 | Chap 4. | 2D Fourier transform, frequency domain processing, |
| 10/23 | Chap 5 | Image restoration, denoising, deblurring, geometric processing |
| 10/30 | Chap 5, Chap 6.1-6.5 | Image restoration, color image processing |
| 11/6 | Midterm | |
| 11/13 | Chap 10.1 - 10.4 | Project progress report due. Image segmentation, Edge detection, edge linking, thresholding |
| 11/20 | Chap 9.1-9.5 | Morphological image processing |
| 11/27 | Chap 8 | Elements of information theory, Lossless and Lossy coding, Image and video compression standards: JPEG and MPEG |
| 12/4 | | Project presentations |
| 12/11 | | Project final report due, Project presentations, review |

**Information about the Term Project**

- ✓ Part of your final grade will be based on a research project.
- ✓ You may work on a paper of your choice from the journal "*IEEE Transactions on Image Processing*" or another reputable journal.
- ✓ You are required to thoroughly understand the problem posed in the paper, and implement (preferably in MATLAB) the method proposed to tackle the problem.
- ✓ You should have chosen a topic (paper) and confirmed the topic with me by the third week– and let me know of your choice as soon as possible (so as to make sure everyone works on a different topic-paper).
- ✓ The due date for the project proposal is the fourth week. In the project proposal, you need to describe in one page your planned project content.
- ✓ The due date for the progress report is the ninth week. In the progress report, you need to describe, in at least three pages, what you have done so far.
- ✓ The due date for the final report is the last week of classes. The final report is a more detailed report, which describes the problem in your words, the work you have done and the problems you encountered while implementing the method etc.
- ✓ We will also possibly hold presentation sessions for the projects for which the times will be announced later.
- ✓ Proposal, progress report and presentations will also affect your project grade.
- ✓ More details about the project are given in an additional document.