

**GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING**

ECE 6258: DIGITAL IMAGE PROCESSING Syllabus (updated on 8/23/2016)

Fall 2016

Course Instructor: Prof. Ghassan AlRegib

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Course Days/Times: TTH 4:35-5:55PM

Office Hours: Wednesdays, 12:00-02:00PM in Office or by appointment (Centergy-I Room 5224). The fifth floor is access controlled. For students to gain access to the 5th floor during office hours, they must use the phone in the lobby on the 5th floor to contact one of the ECE Staff personnel whose phone numbers and names are posted on the directory in the lobby on the 5th floor. After students provide the staff member with a valid reason for gaining access, a staff member will open the door for the student.

Teaching Assistant (TA): Mr. Motaz Alfarraj

E-mail: motaz@gatech.edu

Office Hours:

Wednesdays and Thursdays

11:00am - 12:00PM

or by appointment

Location: TBD

Grading:

Homework	20%	Exam #1*	20%
Concepto in a Video	8%	Exam #2*	20%
Project**	32%		

Exams Dates:

Exam #1: Thursday, September 29, 2016 (*tentative*)

Exam #2: Thursday, November 03, 2016 (*tentative*)

Final Exam: No Final Exam

*No Make-up exams. If you have to be absent for an exam, you need to inform me in advance with an official justification and your next exam will be counted for both. If the absence is caused by emergency, an official paperwork is required.

**The Project Description will be shared and explained on September 06, 2016.

Due Dates:

All sections will have the same due dates for all assignments. This applies to the video section. The video section will be given a flexible window to take the exams.

Academic Honesty: All violations of the Georgia Tech Honor Code will be handled by referring the case directly to the Dean of Students for investigation and penalties. The complete honor code can be found in the GT Policy Library: <http://www.policylibrary.gatech.edu/student-affairs/academic-honor-code>

Attendance: Your attendance and participation are strongly encouraged. I will not log attendance.

Prerequisite: A course in digital signal processing (ECE4270 or equivalent). I expect students to be familiar with MATLAB®.

Course Objective: To introduce the fundamentals and the theory of multidimensional signal processing and digital image processing, including key applications in multimedia products and services, and telecommunications.

Textbook and References:

No required textbook but the following books are excellent references for this class:

1. R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, 3rd edition, Prentice-Hall, 2008 (*officially the textbook of the course*)
2. M. Petrou and C. Petrou, *Image Processing: The Fundamentals*, 2nd Edition, Wiley, 2010 (helpful reference in the first half of the semester)
3. J. W. Woods, *Multidimensional Signal, Image, and Video Processing and Coding*, 2nd Edition, Academic Press, 2012
4. A.K. Jain, *Fundamentals of Digital Image Processing*, Prentice-Hall, 1989
5. J.S. Lim, *Two-dimensional Signal and Image Processing*, Prentice-Hall, 1990
6. M.J.T. Smith, A. Docef, *A Study Guide for Digital Image Processing*, Scientific Pub., 1999

T-square: All announcements will be posted on T-square. Students are expected to utilize the PIAZZA tool to post questions and engage into online discussions.

Travel Dates:

I will be attending a number of technical conferences throughout the semester. During these travel times, the GTA will deliver the lectures.

Available Resources:

- The Center for Academic Success has programs to help students improve their study habits and time management: <http://www.successprograms.gatech.edu/>.
- The Dean Of Students Office helps students who have personal or medical issues that impact their academic performance: <http://www.deanofstudents.gatech.edu/>.

Lectures by Industry: I may invite a visiting colleague from the industry to give one or two lectures to the class.

Special Dates:

- October 11, 2016 (Tuesday): no class; Students Fall Recess
- October 29, 2016 (Saturday): last Day to withdraw with 'W'
- November 24, 2016 (Thursday): no class; Thanksgiving Holiday
- December 06, 2016 (Tuesday): Final Instruction Class Day

Check the Registrar's website for all correct and important dates.

Check the tentative lecture schedule and timeline posted on T-square under the Syllabus Tab. The schedule will be updated frequently.

Tentative Outline:

1. Introduction to multidimensional signal processing
 - 2-D convolution and filtering
 - 2-D discrete-time Fourier transform
 - 2-D sampling and reconstruction
2. 2-D Block transforms
 - DFT
 - DCT
3. Image Compression
 - Concept and techniques for entropy coding
 - Scalar and vector quantization methods for image coding
 - JPEG image compression standard
 - Lossless image compression
4. Image Enhancement
 - Noise reduction methods
 - Contrast enhancement methods
 - Edge sharpening methods
5. Image Quality Measures
 - HVS-based measures
 - PSNR and SSIM
 - Multi-view images
6. Image Restoration
 - Inverse filtering
 - Least squares restoration
 - Constrained least squares method
 - Iterative methods
 - Extrapolation and super-resolution methods
7. Color Processing
 - Color space
 - Color conversion
 - Color component transportation
8. Recent applications and trends in image processing