INSTRUCTOR: Sergio D. Cabrera, Associate Professor  
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OFFICE HRS.: Monday - Thursday 11:20-12:20 PM  
Friday (unless other meetings) 11:30-12:20 PM (send e-mail or call before to confirm)

CLASS TIME/PLACE (tentative): Tuesday and Thursday 9:00 – 10:20 A. M.  
in Classroom Bldg. C302

TEXTBOOKS:
Textbook URL: http://www.imageprocessingplace.com/DIPUM-2E/dipum2e_main_page.htm

Textbook URL: http://www.imageprocessingplace.com/DIP-3E/dip3e_main_page.htm


PREREQUISITE: The following courses or their equivalents: (1) EE3353 (Discrete-Time Signals and Systems) and (2) EE 3384 (Probabilistic Methods). Useful additional background would be one or more of these:
(3) Digital Signal Processing (DSP)  
(4) Biomedical Imaging or Biomedical Signal and Image Processing  
(5) Computer Vision

COMPUTER USAGE: Homeworks and computer assignments will require the use of MATLAB with the Image Processing Toolbox (IPT). The DIPUM Toolbox 2 (m-files or Matlab P-Code) that comes with the textbook will supplement the standard IPT. Some video processing commands to be used are part of the Computer Vision System Toolbox. Having access or experience with other image processing or computer vision software packages such as CVIPTools, ImageJ, LabView, OpenCV, etc. is very beneficial and such packages could be used instead of Matlab in some cases.

COURSE APPROACH: The course will follow closely the theme presented by the Main Textbook. You must have a copy of the textbook for in-class open-book Exams. Graduate students will be required to do a project and Exam 3 will count less for them. Undergraduates taking this course will be allowed to skip the Project so we can cover some video processing topics.
GRADING: Exams 1 and 2 in-class semester exams: 50 %
         Homeworks and computer assignments 20 %
         Final Project (graduate students only) 15%
         Exam 3 15%
         TOTAL 100 % (85% for undergraduates)

PROPOSED TOPICS FROM THE MAIN TEXTBOOK

I- INTRODUCTION (parts of Chapter 1): Matlab and toolboxes, image files, image I/O.

II- INTENSITY TRANSFORMATION AND SPATIAL FILTERING (parts of Chapter 2): contrast modification, histogram equalization, spatial convolution, filter masks, image sharpening, etc.

III- FILTERING IN THE FREQUENCY DOMAIN (parts of Chapter 3): the DFT in 2-D and properties, image smoothing and sharpening in the frequency domain,

IV- GEOMETRIC TRANSFORMATIONS AND IMAGE REGISTRATION (parts of Chapter 5): affine and projective transformations, image coordinate systems, interpolation, etc.

V- COLOR IMAGE PROCESSING (parts of Chapter 6): Color models, color transformations, some basic color image processing, etc.

VI- MORPHOLOGICAL IMAGE PROCESSING (parts of Chapter 9): Basic operations on binary images such as: dilation, erosion, opening and closing, various applications of morphological filters, etc.

VII- IMAGE SEGMENTATION (parts of Chapter 10): Edge detection and linking, adaptive thresholding, region-based segmentation, use of motion, etc.

IX- ADDITIONAL, SPECIAL TOPICS (supplementary material) Video Processing, color-depth image processing, etc.)