EE5372 IMAGE PROCESSING (28125), and
EE4395 -001 FUNDAMENTALS OF IMAGE PROCESSING (23199)
Joint Offering in Spring 2017
Syllabus Version January 17, 2017, UTEP

INSTRUCTOR: Sergio D. Cabrera, Associate Professor
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OFFICE HRS.:

Monday, Wednesday	12:00-12:45 PM (after EE2353)
Tuesday, Thursday	11:30 AM - 12:30 PM
Friday (unless other meetings)	11:00 AM - 12:00 PM (send e-mail or call before to confirm)

CLASS TIME/PLACE: **Tuesday and Thursday 4:30 – 5:50 P. M.**
Liberal Arts Building 206 (subject to change, I hope)

TEXTBOOKS:

(1) Main Textbook: DIGITAL IMAGE PROCESSING, by R. C. Gonzalez and R. E. Woods, 3rd Ed. 2008 or 4th Edition if available in time from Pearson Prentice-Hall.
Textbook URL: http://www.imageprocessingplace.com/DIP-3E/dip3e_main_page.htm

(2) Reference: Digital Image Processing Using Matlab, by R. C. Gonzalez, R. E. Woods, and S. L. Eddins, Second Edition, Gatesmark Publishing, 2010, ISBN 9780982085400
Textbook URL: http://www.imageprocessingplace.com/DIPUM-2E/dipum2e_main_page.htm

PREREQUISITE: The following courses or their equivalents: (1) EE3353 (Discrete-Time Signals and Systems) and (2) EE 3384 (Probabilistic Methods). Optional additional background that would be useful:
(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)***. Having access or experience with other image processing or computer vision software packages such as *CVIPTools, ImageJ, LabView, OpenCV*, etc. is 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 with a presentation and final report. Undergraduates taking this course will be allowed to skip the Project and finish the course early.

GRADING:

Exams 1 and 2 in-class semester exams:	60 %
Homeworks and computer assignments	20 %
Final Project **(graduate students only)**	**20 %**
TOTAL	100 % **(80% for undergraduates)**

PROPOSED TOPICS FROM THE MAIN TEXTBOOK

I- DIGITAL IMAGE FUNDAMENTALS (parts of Chapter 2): visual perception, image acquisition, image sampling and quantization, pixel relationships, Intro. to mathematical tools used in DIP, etc.

II- INTENSITY TRANSFORMATION AND SPATIAL FILTERING (parts of Chapter 3): gamma correction, histogram equalization and matching, spatial convolution, filter masks, image sharpening, Intro. to bilateral filtering (supplement) etc.

III- FILTERING IN THE FREQUENCY DOMAIN (parts of Chapter 4): Fourier transform of 2-D signals and sampling, the DFT in 1-D and 2-D and properties, image smoothing and sharpening in the frequency domain, etc.

IV- IMAGE RESTORATION AND RECONSTRUCTION (parts of Chapter 5): mean and order statistics filters, image degradation estimation, Wiener filtering, Intro. to regularization-based restoration (supplement)

V- COLOR IMAGE PROCESSING (parts of Chapter 6): Color models, color transformations, color corrections, processing of color images, 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, thresholding, region-based segmentation, use of motion in image sequences, etc.

IX- ADDITIONAL, SPECIAL TOPICS (parts of Chapter 7, 11, 3-D image processing, 2-D DSP based on J. Lim's and/or J. Woods' book, etc.)