

**EE4395 FUNDAMENTALS OF IMAGE AND VIDEO
PROCESSING; and
EE5372 IMAGE PROCESSING
Joint Offering in Fall 2015
Syllabus Fall 2015 (August 25, 2015), UTEP**

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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:

- (1) Main Textbook: 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
- (2) Reference1: DIGITAL IMAGE PROCESSING, by R. C. Gonzalez and R. E. Woods, 3rd Ed. 2008, Pearson Prentice-Hall (worth buying at a low price)
Textbook URL: http://www.imageprocessingplace.com/DIP-3E/dip3e_main_page.htm
- (3) Reference2: Practical Image and Video Processing Using MATLAB, by Oge Marques; Wiley/IEEE Press, ISBN-10: 0470048158 | ISBN-13: 978-0470048153

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.)