

# EE5372/EE4371 IMAGE PROCESSING

## Syllabus Fall 2014 (Ver. 1, Aug. 25, 2014), UTEP

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**OFFICE HRS.:** Monday - Thursday 11:20-12:20 PM  
Monday, Wednesday Briefly before or after EE5372 class  
Friday (unless other meetings) 11-12 noon (send e-mail or call before to confirm)

**CLASS TIME/PLACE (tentative): Monday and Wednesday 7:30 – 8:50 P. M. in CRBL 201**

### TEXTBOOKS:

- (1) Main Textbook: DIGITAL IMAGE PROCESSING, by R. C. Gonzalez and R. E. Woods, 3<sup>rd</sup> Ed. 2008, Pearson Prentice-Hall  
Textbook URL: [http://www.imageprocessingplace.com/DIP-3E/dip3e\\_main\\_page.htm](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, McGraw Hill, 2010.  
Textbook URL: [http://www.imageprocessingplace.com/DIPUM-2E/dipum2e\\_main\\_page.htm](http://www.imageprocessingplace.com/DIPUM-2E/dipum2e_main_page.htm)
- (3) Reference: Two-Dimensional Signal and Image Processing, by Jae S. Lim, Prentice-Hall, 1990.
- (4) Reference:

**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) such as EE4383 or EE5371
- (4) Biomedical Imaging or Biomedical Signal and Image Processing such as EE5353
- (5) Computer Vision such as EE5360
- (6) Permission of the instructor (strong mathematical background, etc.)

**COMPUTER USAGE:** Homeworks and computer assignments will require the use of MATLAB with the *Image Processing Toolbox* and possibly the Simulink *Video and Image Processing Blockset* and/or the *Computer Vision System Toolbox* (new). Having access or experience with other image processing or computer vision software packages such as *CVIPTools*, *ImageJ*, *LabView*, *OpenCV*, etc. is very beneficial and could be used to supplement Matlab, let me know. Finally, the DIPUM Toolbox 2 (m-files or Matlab P-Code?) toolbox that comes with Reference #2 above is available through me if you want to test or supplement your work with some of the functions. Let me know.

**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. Depending on student interest, a project may replace Exam 3, see below. Undergraduates taking this course as EE4371 (Engineering Problems Seminar) will be allowed to skip the Project or Exam 3.

<b>GRADING:</b> Two in-class semester exams:	50 %
Homeworks and computer assignments	30 %
Final Project or Exam 3	20 %
<b>TOTAL</b>	<b>100 %</b>

## **PROPOSED TOPICS FROM THE MAIN TEXTBOOK, VERSION 1.0**

I- DIGITAL IMAGE FUNDAMENTALS (parts of Chapter 2, possible supplement on camera imaging): visual perception, image sampling and quantization, pixel relationships, camera imaging system, etc.

II- INTENSITY TRANSFORMATION AND SPATIAL FILTERING (parts of Chapter 3): gamma correction, histogram equalization and matching, spatial convolution, filter masks, image sharpening, 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,

IV- IMAGE RESTORATION AND RECONSTRUCTION (parts of Chapter 5): mean and order statistics filters, image degradation estimation, Wiener filtering, etc.

V- COLOR IMAGE PROCESSING (parts of Chapter 6): Color models, color transformations, color corrections, 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, Intro. to gray scale morphology, 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 (parts of Chapter 7, 11, 3-D image processing, 2-D DSP based on Lim book, etc.)