EE5372 IMAGE PROCESSING, CRN 26300, and
EE4395-001 Special Topics (Fundamentals of Digital Image Processing, CRN 22830)
Joint Offering in Spring 2019
Syllabus Draft Version 1.0, January 22, 2019, UTEP

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OFFICE HRS.: Tuesday & Thursday 11:30 AM – 12:25 PM
(tentative)
Monday & Wednesday 1:30 – 2:00 PM (after EEDIP class)
Friday (unless other meetings conflict) 11-12 noon (send e-mail or call before)

CLASS TIME/PLACE: Tuesday and Thursday 12:00 – 1:20 P. M.
Liberal Arts Building 207

TEXTBOOKS:
2008 (or 4th Edition) from Pearson Prentice-Hall (differences are not very dramatic)
(2) Additional Textbook (IPE): Image Processing for Engineers, by Andrew E. Yagle and Fawwaz T. Ulaby
from University of Michigan Publishing, available for free download.
Textbook URL: http://ip.eecs.umich.edu/

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
For non-EE majors the pre-requisite can be “Mathematical Maturity” and permission from the instructor.

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, CVIPLab, ImageJ, LabView, OpenCV, etc. is beneficial and such packages could be used instead of Matlab in some cases for your own practice.

COURSE APPROACH: The course will follow closely the theme presented by the Main textbook and will be complemented using the other two textbooks (see class Lecture Notes). You must have a PAPER copy of the Main 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 by approximately 2 weeks.
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 (topics from additional textbook to be incorporated gradually)

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 (basics of Fourier Imaging (e. g. MRI), 2-D DSP based on additional textbook or classic textbook)