Computer Engineering 5450: Digital Image Processing
Prior Number – Computer Engineering 345

Credit and Contact Hours
3 credit hours lecture (Three 50-minute or two 75-minute sessions per week are typical).

Instructor
Randy Moss, Ph.D.

Text(s)

Course Information
Course Description
Fundamentals of human perception, sampling and quantization, image transforms, enhancement, restoration, image and video compression and coding.

Prerequisites
Electrical Engineering 3410 (215)
(Co-listed with Electrical Engineering 5450 (345))

Required or Elective
Selected elective

Course Goals
General Outcomes
1. Understand image formation and the role human visual system plays in perception of gray and color image data.
2. Get broad exposure to and understanding of various applications of image processing in industry, medicine, and defense.
3. Learn the signal processing algorithms and techniques in image enhancement and image restoration.
4. Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.
5. Be able to conduct independent study and analysis of image processing problems and techniques.
### Relationship of Course to Program Outcomes

<table>
<thead>
<tr>
<th>ECE Outcome</th>
<th>Course Outcomes</th>
<th>Comments</th>
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<tbody>
<tr>
<td>a</td>
<td>S S S</td>
<td>A balanced approach is taken in introducing mathematical tools and concepts and engineering intuition is stressed.</td>
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<td>b</td>
<td>M S</td>
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<td>c</td>
<td>W M S</td>
<td>Students are introduced to multidisciplinary applications of image processing techniques particularly in industrial automation, medicine and defense.</td>
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<td>d</td>
<td>S M</td>
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<td>e</td>
<td>W M M M S S</td>
<td>Students are encouraged towards life-long learning and scholarship through self-guided research for survey paper and term project.</td>
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<td>f</td>
<td>M</td>
<td>Requirement of the course to write survey paper and term project foster ethical and professional judgment in students.</td>
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<td>g</td>
<td>S</td>
<td>Selected students are encouraged to present their project to class. All students are required to write a project report.</td>
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<td>M S M M M</td>
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<td>k</td>
<td>W W S W S</td>
<td>Use of available computer tools (particularly MATLAB) is promoted in learning the subject matter</td>
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S – strong connection; M – medium connection; W – weak connection

### Topics Covered

1. Introduction Digital Image Processing (1 week)
2. Image Fundamentals and Human Visual Perception (1 week)
3. Image Enhancement in Spatial Domain (2 weeks)
4. Image Transforms (1 week)
5. Image Enhancement in Frequency Domain (1.5 week)
6. Image Restoration (2 week)
7. Image Morphology – Introductory (1 week)
8. Color Image Processing – Introductory (1 week)
9. Image Compression and Coding (2.5 week)
10. Wavelet Transforms – Introductory (1 week)
11. Student Presentations, Reviews, Examinations, and Final (3 weeks)