ECE187 Introduction to Biomedical Imaging and Sensing (4 units)

Imaging and sensing fundamentals: imaging theory, image processing, pattern recognition, digital radiography, computed tomography, magnetic resonance imaging, ultrasound imaging, optical microscopy, super resolution imaging, fluorescence imaging, and Raman scattering sensing.

**Grading Policy:**

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<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
<th>Details</th>
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<tbody>
<tr>
<td>30%</td>
<td>Problem sets</td>
<td>approximately 3 sets</td>
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<tr>
<td>40%</td>
<td>Midterm</td>
<td>in class, close book</td>
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<tr>
<td>40%</td>
<td>Final</td>
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**Suggested References:**


**Course Outline:**

- Introduction – biomedical imaging and sensing at a glance

- General image characteristics, data acquisition and image reconstruction

  Spatial resolution, signal-to-noise ratio, contrast, image filtering, data acquisition, artifacts, Fourier transform, sonograms.

- X-ray planar radiography and computed tomography

  Introduction of X-ray, instrumentation for planar radiography, X-ray contrast agents, computed Tomography (CT), image reconstruction in CT.

- Magnetic resonance imaging (MRI)

  Introduction, effects of strong magnetic field on protons in the body, basis of MR signal detection, MRI imaging and image reconstruction, MRI contrast agents.

- Ultrasound imaging

  Acoustic wave fundamentals, instrumentation, ultrasound transducers, clinical diagnostic, image characteristics, Doppler ultrasound for blood flow measurements.

- Optical imaging and sensing

  Optical microscopy, fluorescence imaging, confocal microscopy, super resolution imaging, Raman scattering and surface enhance Raman scattering for biochemical sensing.