

Physics 390: Biomedical Imaging Spring Semester, 2026

Instructor: Bethe Scalettar
Office: Olin 231
Phone: Ext. 7585
Office Hours: W, F 10:30 – 11:30 a.m.
Th 4:00 – 6:00 p.m.
By appointment
Class Meetings: M, W, F 9:10 – 10:10 a.m.
Final Exam: Thursday, May 7
8:30 – 11:30 a.m. No exceptions
Text: Scalettar and Abney, Introductory Biomedical Imaging: Principles & Practice from Microscopy to MRI, Taylor and Francis 2023

Goals and Outcomes: Imaging is a powerful tool used in fundamental and applied scientific research, particularly in the field of biology. Imaging also plays a crucial role in medical diagnostics, treatment, and research. This course will introduce several cutting-edge imaging techniques used in science and medicine and will explore some of the physics underlying these techniques. Concepts will be explored through lectures, readings, and hands-on activities. Elementary concepts from fields of physics including electromagnetism, optics, and modern physics will be used to explain microscopy, endoscopy, ultrasound, projection radiography and computed tomography, radionuclide imaging, and magnetic resonance imaging. The course also will cover image processing and analysis. At the end of the course, students will have developed (1) a sound understanding of the theoretical foundations of optics, imaging, and image processing, (2) problem-solving skills related to optics, imaging, and image processing, and (3) facility with experimental aspects of optics and imaging.

Course Description: In this course, we will cover a spectrum of microscopy techniques and four major medical imaging techniques. All material will be the subject of lectures and demonstrations and will be reinforced extensively by hands-on homework projects.

Grades will be based on performance on homework, in-class activities, a midterm, and a final, according to the following weightings.

Homework	30%
In-class activities	10%
Midterm	25%
Final exam	<u>35%</u>
TOTAL	100%

I reserve the right to adjust grades slightly based on class participation.