UNIVERSITY OF HOUSTON
Department of Electrical and Computer Engineering
ECE 6397 – Advanced Imaging Techniques
Fall Semester 2018

***Course*:** ECE 6397 4:00 – 5:30 pm TuTh
Instructor: Dr. Xiaonan Shan, Email: xshan@Central.UH.EDU
Office: W306 Engineering Bldg. 2 (D3); Phone: (713) 743-8593;
Office Hours: TuTh 5 :30PM-7 :00PM, or by appointment

Suggested Text

Any version of "Optics" by Eugene Hecht is suggested, but not required.

Required Reading

Course notes

Prerequisites

None

Learning Objectives

The goal of this class is to introduce basic concepts of various advanced imaging techniques in the biomedical and material research field. The brief principle of each technique will be explained, and the most important applications of these techniques will be introduced.

Course Topics

- Basic principle of optics
  - Electromagnetic waves, Maxwell's equation, scattering, reflection, refraction, polarization, interference and diffraction.
- Optical microscope
  - Phase contrast, differential interference contrast (DIC) and confocal microscopy.
  - Super resolution fluorescent micro/nanoscopy.
  - Surface plasmon resonance imaging and near-field scanning optical microscope (NSOM).
  - Infrared spectroscopy and imaging, Raman spectroscopy, SERS and TERS.
- Electron microscopy.
  - Scanning electron microscope.
  - Tunneling electron microscope.
- Other types of microscopy.

- Scanning tunneling microscopy (STM).
- Atomic force microscopy (AFM).
- Nuclear magnetic resonance (NMR).
- Ultrasound imaging.

Expected Course Outcomes:

Students who successfully complete this course are expected to meet the following course outcomes.

- Students will understand the fundamental of optics imaging.
- Student will understand the basic principle of different types of start-of-the-art optical imaging and sensing techniques.
- Student will learn principle of electron microscope and other advanced imaging techniques.
- Students should be able to relate their knowledge in this course with their own research and real world problems.

Grading Policy

Grades will be determined on the basis of final project, exam, homework grades, and attendance as follow:

- Homework (four times) 25%
- Midterm exam 20%
- Attendance 5%
- Final presentation 50%

Grade Point Rule

The following **approximate** grade point scale will be used in determining your grade. This scale may be modified somewhat, but is included here so that you will have a general idea of how well you are doing in the course. The final grade scale will be determined at the end of the semester.

90 - 100: A's 78 - 89.99: B's 66 - 77.99: C's 54 - 65.99: D's below 54: F

Academic Honesty Policy

Students in this course are expected to follow the *Academic Honesty Policy* of the University of Houston. It is your responsibility to know and follow this policy. You **must** sign the Academic Honesty Statement on the last page of this handout, detach it, and submit it to your instructor by Wednesday, August 30, 2017. If you fail to do this, you may be dropped from the course. See the policy on the web at http://catalog.uh.edu/content.php?catoid=21&navoid=5723.

Religious Holy Days

Students whose religious beliefs prohibit class attendance on designated dates or attendance at scheduled exams may request an excused absence. To do this, you are **strongly encouraged** to request the excused absence, in writing, by Wednesday, August 30, 2017. Please submit this written request to your instructor to allow the instructor to make appropriate arrangements. For more information, see the catalog at http://catalog.uh.edu/content.php?catoid=21&navoid=5543.

Students with Disabilities

Students with recognized disabilities will be provided reasonable accommodations, appropriate to the course, upon documentation of the disability with a Student Accommodation Form from the Center for Students with Disabilities. To receive these accommodations, you **must** request the specific accommodations, by submitting them to the instructor in writing, by Wednesday, August 30, 2017. Students who fail to submit a written request will not be considered for accommodations. For more information, see the web at http://www.uh.edu/csd/.

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The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.

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Academic Honesty Statement

I have read the University of Houston Academic Honesty Policy available on the web at
http://catalog.uh.edu/content.php?catoid=21&navoid=5723
I agree to abide by the provisions of this policy.

Name: (Please print) _____

Signature: _____

Date: _____

Please detach this page, and submit it to the instructor by Thursday, August 30, 2018. If you fail to do this, you may be dropped from the course.