

ECE/BioE 467 Biophotonics (Syllabus)

Instructor: Prof. Yun-Sheng Chen

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Instructor Office Hours: Thursday, 1:00 – 2:00 pm or by personal appointment

Lecture: Tuesdays & Thursdays, 9:30 – 10:50 pm, 2015 ECEB

Credit: 3 hours

Pre-Requisites: ECE 455, ECE 460, PHYS 402, or Consent of Instructor. A course in biology or physiology is recommended.

Course Objective:

To introduce principles and survey applications in the field of Biophotonics.

Instructor Teaching & Learning Philosophy:

I believe and teach that technology is becoming increasingly interdisciplinary, particularly between engineering, medicine, and biology. Your ability to learn and integrate ideas and concepts from multiple disciplines will enable you to investigate and solve many of the new engineering problems we will face in the future. I value three things in students and colleagues: hard work, productivity, and creativity. To be successful in my course and in life, you must demonstrate that you possess one or more of these three values.

Course materials:

Course slides and reading material will be distributed weekly.

Classroom lectures will emphasize the main points in the material and allow for discussion. I expect you to read the assigned chapters from the reading materials but focus on the concepts presented in the lecture. Homework and exams will be structured with the assumption that you have read all of the assigned text and handout material.

Recommended Textbooks for background knowledge in cell biology, pathology, and human physiology:

Alberts, et al., **Molecular Biology of the Cell**, Garland Science, 5th edition, 2008

Kumar, Fausto, Abbas, **Robbins & Cotran Pathologic Basis of Disease**, 9th edition, 2014

Vander, Sherman, Luciano, **Human Physiology: The Mechanisms of Body Function**, McGraw Hill, 2004

Other Suggested References:

Saleh and Teich, **Fundamentals of Photonics** (the ECE 460 textbook)
Hecht, **Optics**, 4th edition
Verdeyen, **Laser Electronics** (the ECE 455 textbook)
Wang, **Biomedical Optics: Principles and Imaging**
Born and Wolf, **Principles of Optics**, 7th edition
Hollas, **Modern Spectroscopy**, 4th edition
Vo-Dinh, **Biomedical Photonics Handbook**
Berlien and Muller, **Applied Laser Medicine**
Welch and van Gemert, **Optical-Thermal Response of Laser Irradiated Tissue**

Homework:

There will be five graded homework sets for this course. Homework assignments will be distributed approximately 1 week before they are due. Solutions will be posted on the course website. Late homework will be accepted, but 10% will be deducted for each day it is late.

Problem-Based Learning Report:

There will be Problem Based Learning Reports due on the last day of class. This report will be a comprehensive description and solution to a set of biophotonics-related questions around a medical/surgical case. Students will be expected to integrate their new knowledge to offer technical-based solutions to help a patient with cancer. There will be one class period workshop set aside to discuss and formalize these reports.

Exams:

Two semester exams will be given in class. You will be allowed to have one equation sheet (front and back) for each successive exam (e.g. total of 2 pages for the exam 2).

An excuse from the Dean's office is the only acceptable excuse for missing an exam.

Journal Article Review:

Each student in the class will be required to present to the class one journal article that will cover related course topics throughout the semester and follow the sequence of topics presented in lectures. Journal articles must be pre-approved by Prof. Chen to emphasize the important topic areas. Selected articles will be shared with the class before the presentation, and all students will be expected to read the article and participate in the discussion. The 15 minute presentation (followed by up to 15 minutes of discussion) should discuss the important points of the article, as well as show and discuss the figures, data, and images. Students will be graded on their presentation, their understanding of the material, and their ability to lead the class discussion.

Biophotonics Facilities and Lab Tour:

Our university has a large number of facilities and resources dedicated to biophotonics research, imaging, and microscopy. One class period will be dedicated to visiting and touring some of these campus resources to see first-hand the technology and instrumentation related to biophotonics and biomedical optical imaging.

Grading:

Your final grade in this course will be based on your total score on all the components of the course. The total score is broken down into the following components:

Exam #1	15%
Exam #2	15%
Homework	20%
Problem Report	20%
Article Presentation	20%
Participation	10%
Total	100%

Absences and Excused Grades:

There is no way to make up a missed semester exam. An unexcused absence from a semester exam will be assigned a zero grade. An excused absence requires a letter from the Dean's office. An excused absence from a semester exam will receive an EX grade. At the end of the semester, the EX grade will be replaced with the average of your grades on the other exams and the final.

Grade Disputes:

Grade disputes on homework will be settled at the discretion of the TA. Grade disputes on the semester exams will be settled at the discretion of Prof. Chen. In both cases, the problem in question will be RE-GRADED, making it possible for you to receive a lower score. To dispute an exam grade, you must explain your dispute IN WRITING and staple this to the front of your exam. Prof. Chen will then re-grade your exam.