

## Introduction to Bio-optics

**Course Instructor:** Wen-Pin Hu

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**Office Hour:** By appointment

**Course description:** This course is designed for the students who does not have basic knowledge of bio-optics. This course will provide introduction to make students have a basic knowledge of optics and understand the biomedical applications of optical techniques. In this course, students can learn how to get the images and data through optical instruments. To arise the learning interests of students, some novel optical biomedical sensing technologies will be lectured in this course. Students need to read some review papers of optical techniques and give presentations in the weeks of the midterm and final exams. In the end of this course, students should know the principles of optical techniques, the applications of optical techniques, the development of bio-optics, and the advantages and disadvantages of these optical techniques.

### Pre-requisite:

Students are expected to have basic knowledge in biology, physics, and this course also welcome the undergraduate student of fourth grader.

### Required Textbook:

[1] Robert Splinter, Brett A. Hooper, "An Introduction to Biomedical Optics", 1 edition, CRC Press, 2006. (Required)

**Required Equipment:** A laptop computer (with wireless internet capability)

### Topics and Schedules:

Week	Topic	Hours	Type	Assignments
1	Introduction	3	Lecture	
2	Review of Optical Principles: Fundamental	3	Lecture	
3	Electromagnetic Theory and Description of Light	3	Lecture	
4	Review of Optical Interaction Properties (1)	3	Lecture	Homework 1
5	Review of Optical Interaction Properties (2)	3	Lecture	
6	Light-Tissue Interaction Variables (1)	3	Lecture	Homework 2
7	Light-Tissue Interaction Variables (2)	3	Lecture	

8	Numerical and Deterministic Methods in Light-Tissue Interaction Theory	3	Lecture	
9	Midterm Exam Week	3	Midterm Report	
10	Light-Tissue Interaction Mechanisms and Applications: Photophysical	3	Lecture	
11	Light-Tissue Interaction Mechanisms and Applications: Photochemical	3	Lecture	Homework 3
12	Light-Tissue Interaction Mechanisms and Applications: Photobiological	3	Lecture	
13	Therapeutic Applications of Light: Photobiological	3	Lecture	
14	Diagnostic Applications of Light (1)	3	Lecture	
15	Diagnostic Applications of Light (2)	3	Lecture	Homework 4
16	Diagnostic Methods Using Light: Photochemical	3	Lecture	
17	Diagnostic Methods Using Light: Photobiological	3	Lecture	
18	Final Exam Week	3	Final Report	

**Workload:** There will be 4 homework submissions (10 % each), 2 reports (30 % each for midterm and final report).

For the 2 reports, students have to report the selected review papers related the biomedical applications of optical techniques. Please present the content of selected paper as detailed as possible. For preparing midterm and final reports, students should read the selected paper and some important reference.

**Grading:** Evaluation by Score

90~99 (equal to A)

80~89 (equal to B)

70~79 (equal to C)

Below 70 (equal to F)

**Late Assignments:** All homework assignments were are due within two weeks and must be uploaded to the folder in the e-learning system at the end of the day of submission. Late assignment submissions will be penalized 30%. Besides, late submission for more than 5 days will not be accepted.