

Basic Theories of Biomedical Images and instruments

Course Instructor: Wen-Pin Hu

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Office Hour: By appointment

Course description: This course is designed for the students who interest in the imaging systems used in the hospital. This course introduces basic medical image processing concepts and imaging techniques. Principals of X-ray, computerized tomography, magnetic resonance imaging ultrasound imaging, optical coherence tomography and so on will be lectured in this course. This course also introduce some common used image processing methods for biomedical images. Students need to read some review papers of imaging technologies and give presentations in the weeks of the midterm and final exams. In the end of this course, students should know the principles of imaging techniques, instruments, and the basic concepts for medical image processing.

Pre-requisite:

Students are expected to have basic knowledge in engineering and computer science. This course also welcome the undergraduate student of fourth grader.

Required Textbook:

[1] Geoff Dougherty, "Digital image processing for medical applications", 1 edition, Cambridge University Press; ISBN-13: 978-0521860857, 2009. (Optional)

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

Topics and Schedules:

Week	Topic	Hours	Type	Assignments
1	Introduction	3	Lecture	
2	Medical imaging	3	Lecture	
3	X-ray	3	Lecture	
4	Computerized tomography	3	Lecture	Homework 1
5	Magnetic resonance imaging	3	Lecture	
6	Ultrasound imaging	3	Lecture	
7	Optical coherence tomography	3	Lecture	Homework 2
8	Imaging with gamma ray	3	Lecture	
9	Midterm Exam Week	3	Midterm Report	
10	Fluorescence and confocal microscope	3	Lecture	
11	Near-field scanning optical microscopy	3	Lecture	
12	Basic medical image processing	3	Lecture	Homework 3

13	Image Enhancement	3	Lecture	
14	Image segmentation	3	Lecture	
15	Image restoration	3	Lecture	Homework 4
16	Texture extraction	3	Lecture	
17	Image classification	3	Lecture	
18	Final Exam Week	3	Final Exam 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 imaging systems used in the hospital. 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.