Fundamentals of Medical Imaging: Lectures and Demonstrations

Fundamentals of Medical Imaging (BENG 444 / ENAS 544, MW 11:35am-12:50pm)

Course objectives:

Survey of engineering and physics of modern medical imaging modalities with an emphasis on immersive and interactive experiences. Traditional lectures will be balanced with guest lectures on state-of-the-art techniques and opportunities to observe procedures, acquire data and reconstruct images. Modalities include MRI, CT, SPECT, PET, optical and ultrasound methods.

Instructors:

Gigi Galiana, PhD (Magnetic Resonance Imaging, Optical Imaging)

Dana Peters, PhD (Magnetic Resonance Imaging, Ultrasound Imaging)

Chi Liu, PhD (X-ray, CT, and Nuclear Imaging)

Lecture				Assignment
1	8/30, W	Course introduction, History of Imaging	Galiana	
2	**9/1, *F*** ***due to Labor Day***	Ultrasound 1	Peters	
3	9/6 W	Ultrasound 2	Peters/Guest	HW
4	9/11, M	Math review	Galiana	
5	9/13, W	Foundations of MRI	Peters	HW

6	9/18, M	MRI in the clinic	Clinical radiologist (Jeff Weinreb)	
7	9/20, W	Spatial encoding, making an MR Image	Galiana	HW
8	9/25 M	Hands on MRI 1: Phantom imaging	Peters	
9	9/27, W	Acceleration and reconstruction	Galiana	HW
10	10/2, M	Contrast mechanisms and their application to the body	Peters	
11	10/4 W	Hands-on MRI 2: Human imaging	Peters	
12	10/9, M	Tour of interventional Suite	TBD	
13	10/11 W	Optical Imaging	Galiana	Presentations due

14	10/16, M	Student MRI presentations	Peters, panel of judges	HW
---------- October break 10/17-10/23 ----------				
15	10/23, M	Optical guest	Evelyn Lake	
16	10/25, W	**MIDTERM**	Topics: Ultrasound + MRI	
17	10/30, M	Nuclear physics and X-Ray systems	Liu	
18	11/1, W	CT systems and reconstruction	Liu	HW
19	11/6, M	SPECT and PET systems	Liu	
20	11/8, W	Machine learning in Imaging	John Onofrey (Peters/Galiana)	
21	11/13, M	PET and SPECT reconstruction and quantitative imaging	Liu	HW
22	11/15, W	Introduction to Radiochemistry	Jason Cai	
----------November break, 11/17-11/26----------				

22	11/27 M	Multimodality and application specific imaging	Liu	
23	11/29, W	State of the art & what's next?	Liu	HW
24	12/4, M	PET Center Field Trip	Liu	
25	12/6, W	Guest lecture: SPECT and PET in clinical applications	Gabriela Spilberg	
	TBD, 12/14-12/20	**FINAL EXAM**	Topics: Optical, CT, PET	

Homework problems are posted on Monday or Wednesday by 5pm and are due one week later (corresponding Mon or Wed at 5pm). Homework can be handed in or submitted on canvas. Collaborative discussion about homework is encouraged, but assignments should be completed independently.

Determination of grades:

8 homework sets: 5% each (40% total).

1 presentation: 10%

2 exams: 25% each (50% total)