

MEDICAL PHYSICS 567

THE PHYSICS OF DIAGNOSTIC RADIOLOGY

COURSE OUTLINE

Fall 2013

Instructor: Michael A. Speidel, Ph.D.
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Laboratory: Frank N. Ranallo, Ph.D.
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Prerequisites Students should have completed courses in undergraduate modern physics and calculus, and a course using Fourier analysis.

Lectures There will be two, 1.5 hour lectures per week. Class will meet Tuesday and Thursday at 10:00 AM in 1022 WIMR.

Labs There will be approximately six laboratory modules, taught by Professor Ranallo. Sections and specific times will be assigned as soon as course enrollment has been determined.

Reading Reading assignments will be from books and journals which will be on library reserve (see the attached list).

Exams There will be three exams at regular intervals.

Grading The three exams will count one-quarter each of the final grade. The lab grade will count for one quarter and will be based on lab performance and a lab exam. Homework problems will not be graded but solutions will be provided.

READING ASSIGNMENT REFERENCES

- A. The Essential Physics of Medical Imaging, 2nd edition, JT Bushberg, JA Siebert, EM Leidholdt, JM Boone.
- B. Introduction to Radiological Physics and Radiation Dosimetry, F.H. Attix
- C. Imaging Systems for Medical Diagnostics (2nd ed.), A. Oppelt, Siemens Medical Systems
- D. Christensen's Introduction to the Physics of Diagnostic Radiology, 4th ed., Curry, et al.

SUPPLEMENTAL READING REFERENCES

- E. Physics of Radiology, 2nd ed., A.B. Wolbarst
- F. Imaging Systems for Medical Diagnostics (1st ed.), E. Krestel, Siemens Medical Systems

A, B, C, D, E, F are on reserve at Ebling Library (either as print or electronic resource)
A, B, D, E are on reserve at the Medical Physics Library (print)
Selected texts may also be available at Wendt Library

SYLLABUS

			Class	Lab
T	Sept	3	Introduction to X-ray Transmission Imaging	Lab: Introduction, department tour
W		4		
R		5	X-ray Production Physics	
T		10	X-ray Beam Properties 1	Discussion session
W		11		
R		12	X-ray Beam Properties 2	
T		17	X-ray Generators	Lab 1: X-ray Production and Measurement of HVL
W		18		
R		19	X-ray Tube Construction 1	
T		24	X-ray Tube Construction 2	Discussion session
W		25		
R		26	Spatial Resolution 1	
T	Oct	1	Spatial Resolution 2	Lab 2: Focal spot measurements
W		2		
R		3	Contrast and Noise 1	
T		8	TEST 1	Discussion session
W		9		
R		10	Contrast and Noise 2	
T		15	X-ray Scatter and Grids	Lab 3: X-ray scatter and anti- scatter grids
W		16		
R		17	Screen/Film (Prof. Ranallo)	
T		22	Mammography (Prof. Ranallo)	Discussion session
W		23		
R		24	Computed Radiography (Prof. Ranallo)	
T		29	Active Matrix Flat Panel Imagers	Lab 4: Computed Radiography / Image Receptors
W		30		

R		31	Computed Tomography 1	
T	Nov	5	Computed Tomography 2	
W		6		Lab 5: Computed Tomography
R		7	Computed Tomography 3 (Prof. Ranallo)	
T		12	TEST 2	
W		13		Discussion session and review for lab test
R		14	Fluoroscopy	
T		19	Image Intensifiers	
W		20		Lab test
R		21	Video Systems (Acquisition and Display)	
T		26	DQE 1 (Zero Frequency Analysis, Swank noise, QAD)	
W		27		No lab – Day before Thanksgiving
R		28	Thanksgiving	
T	Dec	3	DQE 2 (Spatial Frequency Analysis, Del Detector Model)	
W		4		No lab – Attend RSNA in Chicago!
R		5	DQE 3 (additive noise, digitization)	
T		10	Special topic	
W		11		No lab
R		12	TEST 3	