

The Hong Kong University of Science and Technology

UG Course Syllabus

Medical Imaging

ELEC4820

3 Credits

Pre-requisites: ELEC2100 AND MATH 2011 AND MATH 2111

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Course Description

This course introduces medical imaging methods to senior undergraduate and graduate students. It covers the following topics: radiation, radiography, computer tomography, radioisotope imaging, diagnostic ultrasound imaging, magnetic resonance imaging, and applications of different imaging modalities.

This course requires basic knowledge of linear algebra, calculus, and geometry. Familiarity with a programming language such as MATLAB is needed.

Lecture schedule:

Week	Learning Objectives	Tutorial/Assignment
1	Course introduction Introduction of five imaging modalities Imaging basics Quality measure	Homework 1
2	X-ray	Tutorial on Fourier Transform and X-Ray
3	CT introduction CT image reconstruction: I	Homework 2
4	CT reconstruction: II	Tutorial on CT
5	Nuclear medicine imaging I	Homework 3 (due on Oct. 15)
6	Nuclear medicine imaging II	Tutorial on nuclear imaging
7	Review and mid-term	Midterm in class. Will announce the date in due course.
8	Ultrasound imaging I	Homework 4
9	Ultrasound imaging II	Tutorial on ultrasound imaging
10	MRI imaging I	Homework 5
11	MRI imaging II	
12	MRI imaging III	Tutorial on MRI
13	Final review	

Assessments:

Assessment Task	Contribution to Overall Course grade (%)
Mid-Term	30%
Homework	20%
Final examination	50%

Required Texts and Materials

Medical Imaging: Signals and Systems, by Jerry Prince and Jonathan Links, Pearson Prentice Hall, ISBN 0-13-065353-5

Additional Resources

1. The Essential physics of Medical Imaging, 2nd Edition
J. T. Bushberg, J. A. Seibert, E. M. Leidholdt, and J. M. Boone,
Lippencott Williams & Wilkins, 2002
2. The physics of Medical Imaging
Steve Webb (ed.), Institute of physics publishing, 1988
3. The Basics of MRI --- online book with many video clips
Joseph P. Hornak <http://www.cis.rit.edu/htbooks/mri/>
4. Diagnostic Ultrasound Imaging: Inside Out
Thomas L. Szabo, Elsevier Science, 2004