

IEE-3752: DIGITAL SYSTEMS SEMINAR 2nd semester 1996

1994 Catalog Data: IEE-3752 Digital System Seminar

Credit: 10

Topics in digital systems selected from research areas of the faculty. This sheet describes the course for the second semester of 1996. For that term the topic is Medical Imaging Systems: Review of linear systems and Fourier transform; X-ray projection imaging; X-ray tomographic imaging; Nuclear medicine imaging; Ultrasound imaging; and Magnetic Resonance Imaging.

Prerequisites: IEE-2102 Signal Analysis

Textbooks: A. Macovski, "Medical Imaging Systems", Prentice Hall, 1983.

References: J. Cameron, J. Skofronick, "Medical Physics", John Wiley & Sons, 1978.

R. Bracewell, "The Fourier Transform and Its Applications", McGraw-Hill, 1986.

D. Nishimura, "Introduction to Magnetic Resonance", Stanford University Notes, 1994.

Coordinator:

Goals: To expose the student to a wide variety of medical imaging systems and to analyse them from a linear systems perspective. The student should be able to identify trade-offs and fundamental parameters for each modality.

Prerequisites by topic:

Topics:

Introduction: General introduction.

Linear systems.

Convolution.

Fourier transform.

Notation.

X-rays: X rays sources.

X rays attenuation.

Projection imaging.

X rays recording.
Resolution and signal to noise considerations.
Computed Tomography.

Nuclear Medicine: Radioactivity and radio-isotopes.

Projection imaging.
The Anger camera.
Signal to noise ratio.
Tomography.
Positron Emission Tomography.

Ultrasound: Sound principles.

Reflexion and attenuation imaging.
Diffraction limited imaging.
Fresnel and Fraunhofer approximations.
Transducer arrays.

Magnetic Resonance: The Bloch equation.

The three main magnetic fields.
Excitation.
The signal equation.
Instrumentation.

Computer usage: none.

Laboratory Projects: none.

ABET category content as estimated by faculty member who prepared this
course description: 100%

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