RADI 6050
Magnetic Resonance Imaging
Spring, 2019

CLASS DAYS and TIME: Tuesdays & Thursdays 1:30- 2:30

CLASSROOM: RII Seminar Room - McDermott, Room 2.534

COURSE FACULTY: Geoffrey Clarke

OFFICE LOCATION and HOURS: McDermott 2.425 2:30-3:00 Thursday

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READ THIS DOCUMENT CAREFULLY - YOU ARE RESPONSIBLE FOR ITS CONTENTS.

COURSE DESCRIPTION AND OBJECTIVES

Course covers the physics and technology of magnetic resonance imaging at an advanced level. This course is designed to give the student a deep understanding of MRI equipment, the processes involved in image formation and trade-offs required to obtain high quality MRI research studies. The emphasis of this course is to describe MRI physics and technology in a manner such that the student will be able to undertake MRI experiments for quantitative biomedical measurements. Students enrolling in this course should be comfortable with vector algebra, differential and integral equations and matrix mathematics. RADI 5049 (Introduction to MRI) or its equivalent should be taken before attempting this course.

Pre-requisites – RADI 6049

Semester credit hours – 2 CU

By the end of this course, each student should be able to:

- apply a fundamental knowledge of NMR physics to understanding the magnetic resonance imaging processes.
- discuss the concepts underlying various technologies used for magnetic resonance imaging.
- recount clinical and research applications of magnetic resonance imaging.

COURSE ORGANIZATION

The main teaching modalities used in this course include:

1) Auditory activities: presenting research and listening to oral presentations

2) Visual activities: reading assignments, watching videos, demonstrations, presentations (including graphs & tables)

3) Tactile/Kinesthetic: solving problems, participating in in-class mini-projects

Materials – Textbook. Articles and other materials will be provided by instructors.

Computer Access – Students are required to bring wifi-enabled laptop for presentation of topics.

Demonstrations – Ten to twelve hands-on sessions for students to learn to use and test NMR equipment.

ATTENDANCE

Attendance is mandatory. Students are expected to advise the instructor in advance if they will not be able to attend a class session. Missing quizzes and exams required prior approval and rescheduling.

TEXTBOOKS

Required: Handbook of MRI Pulse Sequences. MA Bernstein, KF King, XJ Zhou, Elsevier Academic Press, 2004. ISBN-13: 978-0120928613

GRADING POLICIES AND EXAMINATION PROCEDURES

The final grade will be based on the following weighted average: 60% for lab reports, 40% for presentations

Grading System

A = 85-100% B = 70-84% C = 60-70% F = < 60%

REQUESTS FOR ACCOMODATIONS FOR DISABILITIES

In accordance with policy 4.2.3, **Request for Accommodation Under the ADA and the ADA Amendments Act of 2008 (ADAAA)**, any student requesting accommodation must submit the appropriate request for accommodation under the American with Disabilities Act (ADA, form 100). to his/her appropriate Associate Dean of their School and a copy to the ADA Coordinator. Additional information may be obtained at http://uthscsa.edu/eeo/request.asp.

ACADEMIC INTEGRITY AND PROFESSIONALISM

Any student who commits an act of academic dishonesty is subject to discipline as prescribed by the UT System Rules and Regulations of the Board of Regents. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an exam for another person, signing attendance sheets for another student, and any act designed to give unfair advantage to a student or the attempt to commit such an act. Additional information may be obtained at http://catalog.uthscsa.edu/generalinformation/generalacademicpolicies/academicdishonestypolicy/

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Title of the Education Amendments of 1972 is a federal law that prohibits sex discrimination in education. It reads "no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

University of Texas Health Science Center San Antonio's Commitment:
University of Texas Health Science Center San Antonio (UTHSCSA) is committed to maintaining a learning environment that is free from discriminatory conduct based on gender. As required by Title IX, UTHSCSA does not discriminate on the basis of sex in its education programs and activities, and it encourages any student, faculty, or staff member who thinks that he or she has been subjected to sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to immediately report the incident to the Title IX Director.

In an emergency, victims of sexual abuse should call 911. For non-emergencies, they may contact UPD at 210-567-2800. Additional information may be obtained at http://students.uthscsa.edu/titleix/

EMAIL POLICY

none

USE OF RECORDING DEVICES

Permitted for personal use only

ELECTRONIC DEVICES

Electronic devices are permitted as long as they do not become a distraction for the class.

Class **Schedule** is TENTATIVE and will depend upon the progress of the class.

	Date	Subject
1	Tuesday, Jan 8	Introduction & Overview
2	Thursday, Jan 10	MR Image Reconstruction Methods
3	Tuesday, Jan 15	
4	Thursday, Jan 17	The Bloch Equations
5	Tuesday, Jan 22	RF Coil Circuits & Tuning
6	Thursday, Jan 24	LAB 2 (Pharmscan setup/tuning/matching)
7	Tuesday, Jan 29	Relaxation & Hard RF Pulses
8	Thursday, Jan 31	Slice Selective RF Pulses
9	Tuesday, Feb 5	Manipulating Contrast and SNR in MRI
10	Thursday, Feb 7	LAB 3 (TIM Trio tuning/matching/set-up)
11	Tuesday, Feb 12	Using MRI to Measure Spatial Features
12	Thursday, Feb 14	Magnetization Preparation Schemes
13	Tuesday, Feb 19	Relaxation Time Measurements
14	Thursday, Feb 21	LAB 3 (EPI and Functional MRI)
15	Tuesday, Feb 26	MRI for Neurological Disorders
16	Thursday, Feb 28	Blood Flow Measurements with MRI
17	Tuesday, March 5	MR Image Data Processing
18	Thursday, March 7	LAB 4 (RF design & coil building)
	MARCH 11-15	NO CLASS – SPRING BREAK
19	Tuesday, March 19	LAB 5 (Pharmscan Data Processing)
20	Thursday, March 21	Quantitative MRI in Aging & Metabolic Diseases
21	Tuesday, March 26	LAB 6 (Diffusion Imaging & DTI)
22	Thursday, March 28	Localizing 1H-Magnetic Resonance Spectroscopy - (MRS)
23	Tuesday, April 2	LAB 7 (MRI/MRS in brain, lipids)
24	Thursday, April 4	Multinuclear & Multidimensional MRS
25	Tuesday, April 9	LAB 8 (MRS and Phase Contrast Flow Measurements)
26	Thursday, April 11	Tissue Perfusion Imaging with MRI
27	Tuesday, April 16	Vascular Diseases/Quantitative Cardiac MRI
28	Thursday, April 18	LAB 9 (Cardiac MR Imaging)
29	Tuesday, April 23	Quantitative MRI for Cancer Studies
30	Thursday, April 25	Chemical Exchange Saturation Transfer & Magnetization Transfer
31	Tuesday, April 30	LAB 10 (31P MRS/MRI)
32	Thursday, May 2	Quantitative MRI in Liver
33	Tuesday, May 7	Hyperpolarized MRI Methods & Prospects
34	Thursday, May 9	Class Review (Oral Exam)