Course Syllabus
RAD 353

جامعة الملك سعود
King Saud University
كلية العلوم الطبية التطبيقية
قسم العلوم الإشعاعية

Vision

Regional leadership with global reputation in the fields of applied medical sciences

Mission

To contribute in the promotion of the health services of the Saudi community through producing qualified professionals with the ability to compete internationally in applied medical professions, to provide an environment that encourages learning and creativity, and to produce scientific research that contributes in building the knowledge society

Goals

Based on the values of our true religion and culture, we believe in the following values:

Quality and excellence.
Leadership and teamwork.
Academic freedom.
Justice and Integrity.
Transparency and accountability.
Continuous learning.
Professional and ethical responsibility.

Course Syllabus
RAD 353

جامعة الملك سعود
King Saud University
1957
كلية العلوم الطبية التطبيقية
قسم العلوم الإشعاعية

Course Description

This course provides the physical principles and instrumentation of Magnetic Resonance Imaging (MRI) through a combination of lectures and laboratory experiment. The course introduces the theory and physical principles of Resonance Imaging, the major components of MRI scanners, the imaging parameters and their effect in improving image quality, along with the main MRI pulse sequences and their applications with emphasis on safety considerations , the mechanism of k-space filling , data acquisition , image processing, display and manipulation techniques.

Course Objectives

Upon completing this course, the student will be able to:

-Describe various nuclei in a magnetic field.

-Explain how an image is acquired in MR (nuclei in a magnetic field, excitation, relaxation, signal generation).

-Differentiate MR tissue characteristics, such as spin density and T1 and T2 relaxation.

-Understand the behavior of various nuclei in the magnetic field and/or during the application of the radio frequency pulse.

- Apply the imaging parameters and options available to the user for optimal MR images.

-Understand magnetism, magnetic properties and susceptibility.

-Define gauss (g), tesla (T) and the electromagnetic spectrum.

-Describe field strength in relation to image quality (image contrast, SNR and artifacts).

-Explain the functionality of gradients, the shim and radio frequency system in MR imaging.

Course Syllabus
RAD 353

Teaching strategies

Interactive lectures, TBL, MRI lab experiment and group work.

Learning Resources

Clinical practice, CAMS library, MRI lab, interactive learning strategies

Required Text (s)

- **MRI from Picture to Proton** - Book by Donald W. McRobbie
- **MRI in Practice** - Book by Carolyn Roth, Catherine Westbrook, and John Talbot

Essential References

- **MRI Made Easy** (... Well Almost)Book by Hans H. Schild
- **MRI Handbook: MR Physics, Patient Positioning, and Protocols** Book by Muhammed Elmaoglu
- **How does MRI work?** Book by Dominik Weishaupt
- **MRI: Basic Principles and Applications** Book by Mark Alton Brown and Richard Semelka
- **Handbook of MRI technique** Book by Catherine Westbrook

Electronic Materials and Web Sites:

- https://radiopaedia.org/
- https://www.imaios.com/en/e-Courses/e-MRI
- http://mriquestions.com/complete-list-of-questions.html

Course Syllabus
RAD 353

Course rules:

- Students must refrain from studying from the lecture PowerPoint slides and encouraged to use the references in this syllabus and the lecture slides.
- Students are required to attend no less than 75% of all educational activities during the block. Your attendance will be recorded during all sessions. Failure to meet this requirement without a valid explanation will result in exclusion from the final examination
- Recording of lectures or taking pictures are prohibited
- Be good at all times.
- Act maturely.
- Act appropriately.
- Be kind.
- Follow lecturer's directives.
- Respect the rights, feelings and prosperity of everyone.
- Always be on Time and on Task.
- No electronic devices to be used in classroom.
- Follow all rules of conduct set by KSU.
- Expectations for participating in class discussions
- Expectations for Team work activities
- Online - virtual – classes may take action at any day of the semester and the lectures shall be included in the final exams.
- If students have any issues or difficulties, please talk to us or your academic advisor
- If the student miss one assessment or more without excuse, the instructor has the right to refuse or if an instructor is satisfied that an absence for another reason is necessary and

that omitting a grade for the missed assessment will not affect the student's course grade, final evaluation of the student's work in the course may be determined from the remainder of the course work. The instructor may also elect to give a makeup examination. The responsibility for such decisions rests with the instructor only.

Criteria for evaluation:

- Student demonstrate an understanding of course content and concepts.
- Student was able to identify key concepts contained in the questions.
- Once identified, student was able to evaluate, examine, or assess these key concepts.
- Student demonstrate appropriate comprehension level.
- Student demonstrate the ability to produce and clearly express ideas.
- Method of organization is well suited to the topic.
- Proper use of spelling, grammar, and punctuation.
- Students be aware of evaluation criteria for the assignment and the oral presentation.

Course Syllabus
RAD 353

جامعة الملك سعود
King Saud University
كلية العلوم الطبية التطبيقية
قسم العلوم الإشعاعية

Course title and code:	RAD 353
Department:	Radiological Sciences
Program in which the course is offered:	Bachelor of Radiological Sciences
Credit hours:	2+1 = 3
Total contact hours per semester	30+30
Level at which this course is offered:	Level 5
Course prerequisites:	None
Time:	As per www.edugate.ksu.edu.sa
Location:	
College member responsible for the course	Dr. Ashwag Rafea S Alruwaili Dr. Othman Alomair Dr. Manal Alosaimi
Contact information:	
Office Phone Number:	01180587602
WhatsApp:	https://wa.me/message/DBRZSWVXPOE4H1
Email:	ashalruwaili@ksu.edu.sa oalomir@ksu.edu.sa manalosaimi@ksu.edu.sa
Office hours:	On-line through BB

Course Syllabus
RAD 353

جامعة الملك سعود
King Saud University
1957
كلية العلوم الطبية التطبيقية
قسم العلوم الإشعاعية

Topics to be covered

List of topics	Week due	Details
Introduction NMR Physics and basic MRI experiment	Week 2	Atoms, spins, precession
Signal generation	Week 3	Excitation and relaxation
MRI Instrumentation and Hardware	Week 4	Type of magnets, and
Spatial encoding	Week 5	Gradients
Data Collection and Image Formation (K-space)	Week 6	K-space
Imaging weighting and contrast	Week 7	T1. T2. PD and tissue contrast
Basic and Advanced MR Parameters	Week 8	Timing, flip angle SNR, resolution
SE pulse sequences	Week 9	SE, FSE
Inversion Recovery Pulse Sequences	Week 10	IR and Suppression techniques
GRE pulse sequences	Week 11	GRE (spoiled, Coherent), EPI
Advanced MR Pulse Sequences	Week 12	DWI and Perfusion, fMRI
Parallel Imaging	Week 13	SENSE and SMASH

Course Syllabus
RAD 353

Schedule of Assessment Tasks for Students During the Semester

Assessment	Due	Percentage from 100%
Quizzes	Every week	5%
Midterm 1	Week 8-9	20%
Midterm 2	Week 11-12	20%
Group Assignment and Presentation	Week 13	10% (5% group work and presentation) 5% Written document/Report
Continuous Assessment during class	Throughout the semester	5%
End Semester Exam		40%
Required Assignments:	Group project	
Academic Advisor:	**Female students:** Areej Alofi aaloufi@KSU.EDU.SA Aliah bafaqeeh abafaqeeh@KSU.EDU.SA **Male Students:** Abdulmalik Alrawaf: aalrawaf@KSU.EDU.SA	