



**Jordan University of Science and Technology**  
**Faculty of Applied Medical Sciences**  
**Radiologic Technology Department**

RA463 Magnetic Resonance Imaging

First Semester 2023-2024

**Course Catalog**

2 Credit Hours. This course introduces the student to the principles of the MRI. It contains physical and clinical aspects of the imaging process. The physical part introduces the student to the principles of magnetization and nuclear magnetic resonance (NMR), principles of image contrast formation, image weighting and formation, pulse sequences, instrumentation and equipment and MRI safety. On the other hand, the clinical aspect provides the student with a basic knowledge of the imaging protocols and parameters. These protocols include the imaging of head and neck, spine, chest, abdomen, pelvis, lower limbs, and upper limbs

**Text Book**

<b>Title</b>	MRI in practice
<b>Author(s)</b>	Westbrook C. et al.
<b>Edition</b>	3rd Edition
<b>Short Name</b>	MRI
<b>Other Information</b>	

**Course References**

Short name	Book name	Author(s)	Edition	Other Information
MRI at a glance	MRI at a glance	Catherine Westbrook	3rd Edition	

**Instructor**

Name	<b>Dr. Maram Alakhras</b>
Office Location	-
Office Hours	Sun : 12:30 - 14:00 Mon : 11:00 - 12:30 Wed : 11:00 - 12:30 Thu : 09:00 - 10:30
Email	mmalakhras@just.edu.jo

<b>Class Schedule &amp; Room</b>
Section 1: Lecture Time: Mon, Wed : 10:00 - 11:00 Room: M4202

<b>Teaching Assistant</b>
Rasha Elshayib()

<b>Prerequisites</b>		
<b>Line Number</b>	<b>Course Name</b>	<b>Prerequisite Type</b>
143360	RA336 Radiographic Cross Sectional Anatomy Lab	Prerequisite / Study

<b>Tentative List of Topics Covered</b>		
<b>Weeks</b>	<b>Topic</b>	<b>References</b>
Week 1	Atomic structure Motion in the atom MR active nuclei The hydrogen nucleus	From <b>MRI</b>
Week 2	Alignment and precession The Larmor equation and resonance The MRI signal and free induction decay (FID) T1 recovery and T2 decay	From <b>MRI</b>
Week 3	Image weighting and contrast Image contrast Contrast mechanism Relaxation in different tissue	From <b>MRI</b>
Week 4	T1, T2, T2*, and proton density (PD) contrasts Encoding and image formation Encoding Gradients	From <b>MRI</b>
Week 5	Slice selection, Frequency encoding, Phase encoding and K space filling	From <b>MRI</b>
Week 6	Pulse sequences. Spin echo (SE) pulse sequences, Conventional SE Fast or turbo SE	From <b>MRI</b>
Week 7	Inversion recovery (IR) Fast IR Short tau IR (STIR) Fluid attenuated IR (FLAIR) Gradient echo (GE) pulse sequences Conventional GE	From <b>MRI</b> , From <b>MRI at a glance</b>
Week 8	The steady state and echo formation Coherent GE Incoherent (spoiled) GE Steady state free precession (SSFP) Balanced GE Fast GE	From <b>MRI</b> , From <b>MRI at a glance</b>
Week 9	Echo planar imaging (EPI) Parallel imaging techniques Flow phenomena Time of flight (TOF)	From <b>MRI</b> , From <b>MRI at a glance</b>
Week 10	Entry slice phenomena Intra-voxel dephasing Flow phenomena compensation Gradient echo rephrasing (nulling) Spatial pre-saturation	From <b>MRI</b> , From <b>MRI at a glance</b>

Week 11	MRI image artefacts	From MRI, From MRI at a glance
Week 12	Instrumentation and equipment Magnetism Types of magnets	From MRI, From MRI at a glance
Week 13	Fringe field Shim coil Gradient coils	From MRI, From MRI at a glance
Week 14	Radio frequency (RF) coils Patient transportation system Operator interface	From MRI, From MRI at a glance
Week 15	MRI safety Contrast agents Gadolinium Iron oxide	From MRI, From MRI at a glance
Week 16	Final exams week	

Mapping of Course Outcomes to Program Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Demonstrate good knowledge of the NMR and its relation to the image formation.	20%	
Describe the different pulse sequences.	20%	
Practically radiograph the different parts of the patient.	10%	
Identify the different parts of the MRI machine.	10%	
Provide safe environment in the MRI department for workers and patients.	10%	
Describe the types of contrast media used in MRI.	10%	
Describe the flow phenomena and its effect on the image.	10%	
To be aware of the different artefacts and their compensations.	10%	

Evaluation	
Assessment Tool	Weight
In class quizzes	25%
Mid-term exam	25%
Final exam	50%

Policy
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Cheating	The student will be penalized regarding to JUST regulations. If the student has been suspended as a cheater during a course exam, the student will receive a zero at that exam and will receive a Notice from the chair of the department
Statement on Professionalism	Professional behavior is expected of students at all times. Attitude and professional behavior are a minimum criterion for passing this class. Examples of unprofessional behavior include but are not limited to: missing classes, tardiness, lack of attention for a speaker, talking to others during lecture, leaving a lecture prior to its completion without prior authorization of the instructor, working on other class material during class, and sleeping during class.
Cell phone	The use of cellular phone is prohibited in class rooms and during exams. The cellular phone must be switched off in class rooms and during exams.
Attendance	No points will be counted for attendance of this class, however attending the lectures will greatly enhance your grade. The student is responsible for any information discussed in lecture sessions. It is imperative to attend all classes!
Absences	University regulations will be applied. Students are not allowed to be absent for more than 20% of lectures for any reason or excuse. If a student exceeds the absence limit, he or she will not be allowed to sit for future course exams. (Please review university regulation for more details)
Make-up exams	Make-up exams is entitled for students who miss the exam with accepted legal or medical excuse endorsed by the instructor within 24 hours after the scheduled exam (Please review university regulation for more details)

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