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

RA744 Advanced Principles And Clinical Applications In Magnetic Resonance Imaging

First Semester 2024-2025

Course Catalog
3 Credit Hours. This master-level course thoroughly explores advanced principles and clinical applications in Magnetic Resonance Imaging (MRI). It encompasses a detailed examination of the theoretical foundations of MRI technology, including principles of magnetic resonance, pulse sequence design, image acquisition, and advanced image processing techniques. Additionally, the course examines a diverse range of clinical applications of MRI across various anatomical regions and pathological conditions, emphasizing evidence-based practice and emerging trends in the field.
Teaching Method: On Campus

Text Book	
Title	Magnetic Resonance Imaging : Physical Principles and Sequence Design
Author(s)	Robert W. Brown, Yu-Chung N. E. Mark Haacke, Michael R. Thompson, Ramesh Venkatesan
Edition	2nd Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	Magnetic Resonance Imaging Handbook	Luca Saba	1st Edition	
3	?Principles of Magnetic Resonance Imaging: A Signal Processing Perspective	Zhi-Pei Liang, Paul C.Lauterbur	1st Edition	
4	MRI: Basic Principles and Applications	Brian M. Dale, Mark A. Brown, and Richard C. Semelka	4th Edition	

Class Schedule & Room

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Revisit Fundamentals of MRI	From **1**, From **2**, From **3**, From **4**
Week 2	MRI Image Formation and Pulse Sequences	From **1**, From **2**, From **3**, From **4**
Week 3	MRI Imaging Systems -Magnets	From **1**, From **2**, From **3**, From **4**
Week 4	MRI Imaging Systems gradients	From **1**, From **2**, From **3**, From **4**
Week 5	MRI safety and artifacts 1	From **1**, From **2**, From **3**, From **4**
Week 6	MRI safety and artifacts 2	From **1**, From **2**, From **3**, From **4**
Week 7	Fast Imaging	From **1**, From **2**, From **3**, From **4**
Week 8	Imaging Acceleration and Reconstruction	From **1**, From **2**, From **3**, From **4**
Week 9	Flow and Motion	From **1**, From **2**, From **3**, From **4**
Week 10	Cardiovascular MRI	From **1**, From **2**, From **3**, From **4**

Week 11	Cardiovascular MRI 2	From **1**, From **2**, From **3**, From **4**
Week 12	Functional MRI	From **1**, From **2**, From **3**, From **4**
Week 13	Functional MRI	From **1**, From **2**, From **3**, From **4**
Week 14	MRI Diffusion	From **1**, From **2**, From **3**, From **4**
Week 15	MRI spectroscopy	From **1**, From **2**, From **3**, From **4**
Week 16	Revision	From **1**, From **2**, From **3**, From **4**

Mapping of Course Outcomes to Program Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
develop proficiency in designing MRI pulse sequences tailored to specific clinical applications.	20%	
acquire advanced skills in MRI image reconstruction, including the utilization of Fourier Transform principles, k-space sampling strategies, finite sampling effects, and parallel acquisition concepts	20%	
gain an in-depth understanding of various MRI image contrast mechanisms, including relaxation processes, contrast agents, and tissue properties affecting image contrast	20%	
evaluate the clinical applications of advanced MRI techniques, including diffusion-weighted imaging, perfusion imaging, spectroscopy, and functional MRI	20%	
learn essential skills in MR data acquisition, protocol optimisation, and quality assurance, enabling them to translate theoretical knowledge into real-world clinical settings effectively.	20%	

Relationship to Program Student Outcomes (Out of 100%)												
PLO B1	PLO B2	PLO B3	PLO B4	PLO B5	PLO B6	PLO B7	PLO M1	PLO M2	PLO M3	PLO M4	PLO M5	PLO M6

Evaluation	
Assessment Tool	**Weight**
mid exam	50%
final exam	50%

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