The Hashemite University
Faculty of Allied Health Sciences
Department of Medical Imaging
Course Syllabus

Course information	
Course Title	Magnetic Resonance Imaging (01)
Course Code	110508334
Prerequisites	110102161
Credit Hours	3

Course Description
This course covers different basic topics such as basic physics of NMR, relaxation phenomena, relaxation time measurement, basic NMR imaging theory and methods, biophysical background of tissue NMR, image contrast manipulation, image artifacts, contrast agents in MRI, basic imaging pulse sequences, spatial encoding, k-space, hardware for MRI, quality control and MR safety.

Course Objectives By the end of this course, the student is expected to:
Be able to understand the physical principles of nuclear magnetic resonance and major hardware components of the MRI scanner and MR safety.
Be able to describe the process of relaxation phenomena and the biophysical background of tissue NMR.
Be able to understand the process of image contrast manipulation.
Be able to understand the different types of MR image artifacts and their manipulation
Be able to describe the process of signal encoding and image formation

Recommended Textbook	
Title	MRI in practice
Author	Catherine Westbrook, Carolyn Roth, John Talbot
Publisher	Blackwell
Year	2005
Edition	Third
Other References	
Title	MRI from picture to proton
Author	Donald McRobbie, Elizabeth Moore, Martin Graves, Martin Prince
Publisher	Cambridge
Year	2008
Edition	Second
Title	MRI the Basics
Author	Ray Hashemi, William Bradlly, Christopher Lisanti
Publisher	Lippincott Williams and Wilkins
Year	2010
Edition	Third
Website	http://www.cis.rit.edu/htbooks/mri/
Website	http://www.imaios.com/en/e-Courses/e-MRI/
Website	http://www.mr-tip.com/serv1.php
Website	http://www.mritutor.org/
Website	http://www.revisemri.com/
Website	http://medicalphysicist.co.uk/mriportfolio.htm
Website	http://www.ismrm.org/mr_sites.htm

Website	http://www.users.on.net/~vision/
Website	http://www.mrisafety.com/
Website	http://www.refindia.net/rlinks/reviewedlinks/functional_MRI.htm
Website	http://psychology.uwo.ca/fmri4newbies/
Website	http://www.eecs.umich.edu/~dnoll/primer2.pdf

Course Contents

Part One: Nuclear Magnetic Resonance (NMR)

- Introduction
- Interaction of magnetic moment (μ) with the external magnetic field (Bo) and RF (B1) field
- Magnetic Susceptibility
- Relaxation Phenomena
- Image contrast mechanisms
- Gradient echo versus Spin echo
- Measurement of relaxation times
- Biophysical basis of relaxation phenomena

Part Two: MR Hardware and Safety

- MR hardware (Magnet)
- MR hardware (Magnetic field gradients)
- MR hardware (Radio frequency fields)
- MRI Safety

Part Three: Spatial Encoding and k-Space

- Spatial encoding (slice selection)
- Spatial encoding (frequency encoding)
- Spatial encoding (phase encoding)
- K-space and signal sampling
- Field of view and spatial resolution
- Imaging parameters and tradeoffs
- Quality Assurance

Assessment

First Exam	25%
Second Exam	25%
In course assessment	10%
Final Exam	40%