Shahid Beheshti University of Medical Sciences
School of Allied Medical Sciences

Curriculum

Master of Medical Imaging Technology -MRI

Technological advances in Magnetic Resonance Imaging (MRI) have led to a greater range of clinical applications, such that MRI is now a core imaging modality in contemporary healthcare. This course, aimed at radiologic technologists working in MRI, integrates the physical principles of MRI with practical clinical applications.

This course aims to foster the personal and professional development of the graduate technologists by encouraging students to develop core knowledge, cultivate a critically questioning approach to MR imaging practice, foster constructive change within the workplace, and direct high-quality MR Service provision.

The MSc MRI program is designed for radiology technologists who wish to provide high quality healthcare by deepening and broadening their knowledge and expertise in the field of Magnetic Resonance Imaging (MRI).

This MSc program, builds on knowledge and clinical practice skills gained, and developing a greater focus on advanced MR imaging technology and applications such as fMRI, DTI, DTT, MRS and SWI within both clinical and research arenas.

Practice-based modules address the spectrum of routine and advanced applications of MRI in the central nervous, musculoskeletal and cardiovascular systems, together with applications in the Breast, abdomen and pelvis. This provides the knowledge-base for students to evaluate MR scanning protocols and resultant image appearances for diverse clinical indications, and to justify clinical decision-making.

- Admission Requirements

  A) Having the general eligibility to enter Master of Science course according to the educational code approved by Higher Council for Planning Medical Sciences after passing the entrance exam.

  B) Having BSc degree in Radiology Technology.

- Course Duration (2-2.5 years)

Course duration and structure of MSc in Medical Imaging Technology –MRI is based on educational codes of study in MSc courses approved by Higher Council for planning of Medical Sciences.

- Courses (Credits)

Type of lesson	Credits
Basic Science	4 (according to table B)
Core	28(according to table C)
Dissertation	5
Total (excluding dissertation)	32
Total (including dissertation)	37

Note: Besides the core credits, students should take some additional courses from Table A, as identified by the department and approved by the Council of the Graduate School.

Table A: List of Prerequisite Lessons – MSc of Medical Imaging Technology-MRI

Lesson Code	Lesson Title	Credits			Credit (hours)	
		Theory	Practical	Total	Theory	Practical
01	Nuclear Physics	3	-	3	51	
02	General Mathematics	3	-	3	51	
03	Biostatistics	2	-	2	34	
04	Digital Image Processing Using MATLAB	2	1	3	34	34
05	Medical Information Systems	0.5	0.5	1	9	17
Total		10.5	1.5	12		

Besides the core credits, students should take some additional courses from Table A, as identified by the department and approved by the Council of the Graduate School.

Table B: List of Basic Science lessons- MSc of Medical Imaging Technology-MRI

Lesson Code	Lesson Title	Credits			Credit (hours)	
		Theory	Practical	Total	Theory	Practical
06	Research Methods	2	-	2	34	-
07	Sectional Anatomy	2	-	2	34	-
Total		4	-	4		

Table C: List of Core Lessons – MSc of Medical Imaging -MRI

Lesson Code	Lesson Title	Credits			Credit (hours)		Prerequisite(s)
		Theory	Practical	Total	Theory	Practical	
08	Principles of Magnetic Resonance Imaging	4	-	4	68	-	None
09	Magnetic Resonance Imaging Techniques	3	-	3	51	-	08
10	Advanced Protocols and Procedures in MRI	4	-	4	68	-	08
11	MRI Equipment	1	-	1	17	-	08
12	MR Images Interpretation	2	-	2	34	-	09
13	Special English	2	-	2	34	-	None
14	Seminar	1	-	1	17	-	08-09-10
15	Clinical Internship	-	6	6	-	306	08-09-10
16	Dissertation	5	-	5			
total				28			

MSc of Medical Imaging – MRI
Course Schedule details

Semester 1 – Fall Semester

#	Lesson code	Lesson Title	Credits	Basic/Core/ Pre requisites	Pre-requisites/co-requisite
1	03	Biostatistics	2	Pre requisites	None
2	04	Digital Image Processing Using MATLAB	3	Pre requisites	None
3	05	Medical Information Systems(theory)	1	Pre requisites	None
5	07	Sectional Anatomy	2	Basic	None
6	08	Principles of Magnetic Resonance Imaging	4	Core	None
7	06	Research Methods	2	Basic	None
Total			**14**		

Semester 2 – Spring Semester

#	Lesson code	Lesson Title	Credits	Basic/Core/ Pre requisites	Pre-requisites/co-requisite
9	09	Magnetic Resonance Imaging Techniques	3	Core	08 or Co-requisite
10	13	Special English	2	Core	None
11	11	MRI equipment	1	Core	08 or Co-requisite
12	02	General Mathematics	3	Pre requisites	None
Total			**9**		

Semester 3 – Fall Semester

#	Lesson code	Lesson Title	Credits	Basic/Core/ Pre requisites	Pre-requisites/co-requisite
13	10	Advanced Protocols and Procedures in MRI	4	Core	08
14	12	MR Images Interpretation	2	Core	09
15	14	Seminar	1	Core	08-09-10
16	15	Clinical Internship	6	Core	08-09-10
Total			**13**		

Semester 4 – Spring Semester

#	Lesson code	Lesson Title	Credits	Basic/Core/ Pre requisites	Pre-requisites/co-requisite
17	09	Dissertation	5	Core	
Total			**5**		

MSc of Medical Imaging (MRI) - Lesson Descriptions

Lesson Title	Nuclear Physics
Lesson Code	01
Lesson Description: This course aims to enable students to develop knowledge and understanding of the theoretical and Basic principles of nuclear physics , interactions, properties of atom and subatomic particles,… and as much as it concerns to Magnetic Resonance Imaging Technology that a candidate should know.	
Lesson Title	General Mathematics
Lesson Code	02
Lesson Description: This course aims to enable students to develop knowledge and understanding of the important concepts in General Mathematics, Differentials, Integrals, Tensors, Fourier Transform as much as concerns to Magnetic Resonance Imaging Technology that a candidate need to know.	
Lesson Title	Biostatistics
Lesson Code	03
Lesson Description: This course aims to enable students to develop knowledge and understanding of the principles and concepts of Biostatistics and their application in Clinical MR imaging in routine practice.	
Lesson Title	Digital Image Processing Using MATLAB
Lesson Code	04
Lesson Description: This course aims to enable students to learn the theoretical and practical aspects of digital MR image processing and programming in MATLAB software environment.	
Lesson Title	Medical Information Systems
Lesson Code	05
Lesson Description: This course aims to enable students to develop knowledge and understanding of the theoretical and applied aspects of Medical information systems, Databases, Search engines and related subjects .	
Lesson Title	Research Methods
Lesson Code	06
Lesson Description: This course aims to introduce students with principles and concepts of research, designing a research and related methodology with focus on Medical Imaging projects.	
Lesson Title	Sectional Anatomy
Lesson Code	07
Lesson Description: This course aims to teach the students ; the principles of human anatomy in cross sections applied to Magnetic Resonance Imaging along with comparison modalities in the diagnostic imaging .This course provides critical cross section analysis of human anatomy in preparation for Head and neck ,Chest ,abdomen , pelvis and extremity MR scanning.	

Lesson Title	Principles of Magnetic Resonance Imaging
Lesson Code	08
Lesson Description: This course enable students to learn the physical principles of Magnetic Resonance Imaging with main focus on their role in clinical applications. Topics addressed include: Basic and advanced MR pulse sequences and scanner functional options , Data acquisitions , signal encoding , K space filling and related properties , imaging artifacts, Flow phenomena , Common MR Angiographic techniques , Diffusion weighted imaging techniques and Image quality.	
Lesson Title	Magnetic Resonance Imaging Techniques
Lesson Code	09
Lesson Description: This course aims to enable students to develop knowledge and understanding of the precise performing of MR scans in evaluating the normal anatomy and pathologic conditions of human body systems mainly including Central Nervous system , Thorax and cardiovascular vascular system, Breast , Musculoskeletal system, Gastrointestinal and Genitourinary system. Here we provide students with the knowledge of intellectual and appropriate selection of MR sequences , parameters and imaging planes in case of encountering with various pathologic conditions and diseases besides considering patient safety.	
Lesson Title	Advanced Protocols and Procedures in MRI
Lesson Code	10
Lesson Description: This course aims to enable students to develop knowledge and understanding of advanced Neurological MR imaging techniques and procedures including Functional Magnetic Resonance Imaging (fMRI), Diffusion Tensor Imaging (DTI), Diffusion Tensor Tractography (DTT) and Magnetic Resonance Spectroscopy (MRS).For each of the above topics there will be consideration of the underlying physical principles, method of image acquisition , quality control and hands on image processing tasks in relation to each procedure.	
Lesson Title	MRI equipment
Lesson Code	11
Lesson Description: This course aims to enable students to develop knowledge and understanding of the theoretical and Basic principles of MR Scanner hardware and components including evaluation of different types of magnets used in MR scanners together with their properties, cooling system, coil technology and ABC of MR quality control tests and maintenance.	
Lesson Title	MR Images Interpretation
Lesson Code	12
Lesson Description: This course aims to enable students to develop knowledge and understanding of the basic concepts of MR image interpretation. Here students learn the normal appearance of anatomical stractures and their changes in pathological conditions on MR images .This course includes the evaluation of CNS, MSK, breast and abdominal MR Images.	

Lesson Title	Special English
Lesson Code	13
Lesson Description: This course aims to enable students to develop and enhance their reading and comprehension skills using routine and applied English texts in the field of Magnetic Resonance Imaging.	
Lesson Title	Seminar
Lesson Code	14
Lesson Description: This course aims to enable students to integrate their acquired knowledge and having the ability of delivering a lecture in one of the updated and applied subjects of MR imaging.	
Lesson Title	Clinical Internship
Lesson Code	15
Lesson Description: This module primarily involves student directed learning within a clinical MR imaging department at university hospitals, with the aim of facilitating the integration of theoretical concepts and professional clinical practice in order to consolidate the learning process. Specifically, it provides an opportunity for students to become competent and demonstrate high-level clinical skills in the performance of MR examinations of the CNS, head and neck, musculoskeletal system, breast, body and vascular system. It further aims to help students develop professionally in a manner that is largely autonomous.	
Lesson Title	Dissertation
Lesson Code	16
Lesson Description: At this level, students are consistently expected to be able to provide an evidence base to prove the effectiveness of their professional interventions in one of the preferably applied sunjects or fields of MR imaging. This module provides students with the experience of utilizing all principles of research design. Following submission and approval of a dissertation proposal the student is provided with a project supervisor to facilitate support for both the project and dissemination material. The students will be required to undertake an independent piece of research study into a topic relevant to their own field. Learning outcomes: -Systematically plan and execute practical research relevant to medical imaging, with specific attention to time management, research governance, ethics and health and safety. -Critically appraise the relevant literature to develop an independent and focused research proposal and seek appropriate forms of approval. -Critically evaluate relevant research methodologies relevant to their research topic of their choice.	

-Select and justify data analysis techniques which are appropriate to the specific research question and critically analyze data with insight and understanding and specificity to the research question.

-Demonstrate the ability to present research findings, evaluate and analyze this finding and propose recommendations

-Have developed skills appropriate to the presentation of scientific research results e.g. published article, poster presentation etc.

Course Director:

Dr. Fariborz Faeghi

Head Of Radiology Technology Department

Associate Prof. of Medical Physics

MRI Clinical Physicist

Email: f_faeghi@sbmu.ac.ir

Contact Phone: (office) +98 21 22718505 +98 21 22711131