

R T 71A: ADVANCED CLINICAL EXPERIENCE: MAGNETIC RESONANCE IMAGING I

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2026
Units:	14
Hours:	16 lecture, 480 laboratory per quarter (496 total per quarter) 40 hours clinical laboratory per week for 12 weeks, with 16 hours of didactic content.
Prerequisite:	Current ARRT and CRT Certification as a Radiologic Technologist or current student in the Foothill College Radiologic Technology Program; R T 62A and 62C.
Advisory:	Not open to students with credit in R T 71.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable
Formerly:	R T 71

Student Learning Outcomes

- Critique and distinguish relevant sectional anatomy and pathology related to magnetic resonance imaging
- Demonstrate proper equipment manipulation and assist in the performance of magnetic resonance imaging procedures, applying appropriate patient care and magnetic safety principles in the clinical setting

Description

This course focuses on patient care, safety, image production, and procedures related to magnetic resonance imaging (MRI), as well as a clinical practicum in a magnetic resonance department. Practical experience is implemented to expose the post-graduate radiologic technology student to the principles of MRI, with emphasis on neurological, spine, and body MRI procedures.

Course Objectives

The student will be able to:

1. Demonstrate knowledge in magnet safety for the patient, personnel, and self.
2. Demonstrate application of knowledge and understanding in the proper use of the MRI equipment.
3. Adhere to standards of attendance, punctuality, and dependability.
4. Conduct themselves in a professional manner.
5. Apply theory to practice by exhibiting ongoing, satisfactory job performance skills.

6. Select proper scanning techniques and patient positioning as outlined by the department protocols.
7. Demonstrate knowledge and application of various patient care techniques.
8. Differentiate anatomy and pathophysiology as it relates to MR imaging, with an emphasis on neurological, spine, and body procedures.
9. Critique and evaluate MR images for good diagnostic quality.

Course Content

1. Safety issues in MRI
 - a. MRI screening and safety
 - i. Screening and education
 1. Implants
 2. Ferrous foreign bodies
 3. Medical conditions
 4. Prior procedures
 5. Topical or externally applied items
 - ii. Radiofrequency field
 - iii. Gradient field
 - b. Electromagnetic fields
 - i. Static field
 - ii. Radiofrequency field
 - iii. Gradient field
 - c. Equipment
 - i. Placement of conductors
 - ii. Cryogen safety
 - iii. Ancillary equipment
 - d. Environment
 - i. Climate control
 - ii. Designated MR safety zones
 - iii. Gauss lines
 - iv. Emergency procedures
2. Physical principles of image formation
 - a. Instrumentation
 - i. Electromagnetism
 - ii. Static magnet
 - iii. Radiofrequency (RF) system
 - iv. Gradient system
 - b. Fundamentals
 - i. Nuclear magnetism
 - ii. Tissue characteristics
 - iii. Spatial resolution
 - c. Artifacts
 - i. Aliasing
 - ii. Gibbs
 - iii. Chemical shift
 - iv. Chemical misregistration
 - v. Magnetic susceptibility
 - vi. RF
 - vii. Motion and flow
 - viii. Partial volume averaging
 - ix. Cross-talk
 - x. Cross-excitation
 - xi. Moire pattern
 - xii. Parallel imaging artifacts

- xiii. Eddy current
 - xiv. Dielectric effect
- d. Quality control
 - i. Slice thickness
 - ii. Spatial resolution
 - iii. Contrast resolution
 - iv. SNR (signal to noise ratio)
 - v. Center frequency
 - vi. Transmit gain
 - vii. Geometric accuracy
 - viii. Equipment inspection
- 3. Punctuality and dependability
 - a. Clinic time reporting
 - b. Absenteeism
 - c. Communicating whereabouts appropriately
- 4. Professional conduct
 - a. Taking initiative
 - b. Communicating effectively
 - c. Conducting oneself in a professional manner
- 5. Job performance
 - a. Scanning according to protocol
 - b. Planning and organizing work efficiently
 - c. Being alert and interested in examinations
 - d. Reading and understanding requisition
 - e. Communicating effectively
 - f. Completing exam in a reasonable amount of time
- 6. Scanning techniques
 - a. Patient positioning
 - b. Pulse sequences
 - c. Coil selection
 - d. Documentation of procedure
 - e. Imaging parameters
 - i. Repetition time
 - ii. Echo time
 - iii. Inversion time
 - iv. Number of signal averages
 - v. Flip angle
 - vi. Field of view
 - vii. Matrix
 - viii. Pixel
 - ix. Voxel
 - x. Number of slices
 - xi. Slice thickness
 - xii. Phase and frequency
 - xiii. Echo train length
 - xiv. Effective echo time
 - xv. Bandwidth
 - xvi. Concatenations
 - xvii. B-value
 - xviii. Velocity encoding
 - f. Image contrast
 - i. T1 weighted
 - ii. T2 weighted
 - iii. PD weighted
 - iv. T2* weighted
 - v. Diffusion weighted imaging
 - vi. Susceptibility weighted imaging
- g. Imaging options
 - i. 2-D and 3-D
 - ii. Slice order
 - iii. Spatial saturation pulse/band
 - iv. Gradient moment nulling
 - v. Suppression techniques
 - vi. Physiologic gating and triggering
 - vii. In-phase and out-of-phase
 - viii. Rectangular field of view
 - ix. Anti-aliasing
 - x. Parallel imaging
 - xi. Filtering
- 7. Patient care
 - a. Patient Interactions and management
 - b. Requisition/medical record evaluation
 - c. Room preparation
 - d. Patient assessment
 - i. Patient history/allergies
 - ii. Physical assistance and monitoring
 - 1. Patient transfer techniques
 - 2. Sedated patients
 - 3. Claustrophobic patients
 - iii. Medical emergencies
 - e. CDC standard precautions
 - f. Infection control
 - g. Patient discharge/post-procedure instructions
- 8. Procedures
 - a. Neurological
 - i. Head and neck
 - 1. Brain
 - 2. Brain for Multiple Sclerosis
 - 3. Brain for seizure
 - 4. Infant brain (less than one year old)
 - 5. Brain perfusion
 - 6. Cerebral spinal fluid (CSF) flow
 - 7. Brain spectroscopy
 - 8. Internal auditory canals (IACs)
 - 9. Pituitary
 - 10. Orbits
 - 11. Cranial nerves
 - 12. Sinuses
 - 13. Soft tissue neck
 - 14. Vascular head
 - 15. Vascular neck
 - b. Spine
 - i. Cervical
 - ii. Thoracic
 - iii. Lumbar
 - iv. Sacroiliac (SI) joints

- v. Sacrum-coccyx
- vi. Total spine
- vii. Lumbar plexus
- c. Body
 - i. Thorax
 - 1. Chest (noncardiac)
 - 2. Breast
 - 3. Vascular thorax
 - 4. Brachial plexus
 - ii. Abdomen
 - 1. Liver
 - 2. Pancreas
 - 3. Adrenals
 - 4. Kidneys
 - 5. Enterography
 - 6. Vascular abdomen
 - 7. Magnetic resonance cholangiopancreatography (MRCP)
- 9. Image display/quality
 - a. Data acquisition, processing, and storage
 - i. Spin echo
 - ii. Inversion recovery
 - iii. Gradient echo
 - iv. Echo planar imaging
 - v. Diffusion weighted imaging
 - vi. Susceptibility weighted imaging
 - vii. Perfusion
 - viii. Spectroscopy
 - b. Data manipulation
 - i. K-space
 - ii. Fast Fourier transformation
 - iii. Nyquist theorem
 - iv. Postprocessing
 - c. Informatics
 - i. Hard/electronic copy
 - ii. Archive
 - iii. Picture archiving and communication system (PACS)/medical image management and processing system (MIMPS)
 - iv. Security and confidentiality
 - v. Networking

Research project: case study
Clinical performance evaluation

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Discussion
Demonstration
Clinical practice

Representative Text(s) and Other Materials

Westbrook, Catherine. Handbook of MRI Technique. 2021.

Westbrook, Catherine, and John Talbot. MRI in Practice. 2018.

Hashemi, Ray. MRI The Basics. 2017.

Although some of these texts are older than the suggested "5 years or newer" standard, they remain seminal texts in this area of study.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Reading assignments as required by the Magnetic Resonance Imaging department.
2. Research a topic related to MRI imaging.

Discipline(s)

Radiological Technology

Lab Content

1. Radiologic technology (magnetic resonance imaging) clinical practice
 - a. Imaging procedures
 - b. Data acquisition
 - c. Data processing
 - d. Physical principles of image formation
 - e. Patient care and safety in a clinical setting

Special Facilities and/or Equipment

1. Clinical setting: magnetic resonance imaging equipment.
2. Computer/internet access for online component.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following: