



Pulse Radiology Education

Pulse Radiology

Online MRI Program plus Clinical Training

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OFFICE HOURS: Monday - Friday

Schedule a call via the link provided in introductory email.

Saturday & Sunday

Accessible only via e-mail

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DESCRIPTION OF COURSE

This course is an ARRT Approved, Structured Education Online Program. This course is also an approved RCEEM by the American Society of Radiologic Technologists (ASRT). The structured education online portion is comprised of 14 online, weekly modules which includes: 11 video lectures followed by 11 weekly tests, one (1) 100-question midterm, one (1) 220-question Mock MRI Registry and one (1) week dedicated to Clinical Requirements and Registry Preparation.

Part A: Online MRI Structured Education

The goal of this online structured education course is to provide ARRT radiologic technologists, ARDMS sonographers, NMTCB technologists, and radiation therapists the fundamental principles and comprehensive knowledge to be fully prepared to sit confidently for the MRI certification exam administered by the American Registry of Radiologic Technologists (ARRT). Pulse Radiology MRI Trainees will learn to apply formulas to calculate precessional frequency through the Larmor Equation and analyze positive and negative linear variations from gradient pulse applications. The ability to understand the formation process of a diagnostic MR image is vital and will be discussed with in-depth analysis of pulse sequence design and k-Space raw data generation. The skills to be able to identify the causes and appearances of MRI artifacts will be taught which is important knowledge for the MRI Registry and also daily MR practice.

Part B: Clinical Training

MRI trainees will be assigned access to Pulse Radiology affiliated MRI centers to develop their practical skills through observation, training and advanced learning from registered MRI technologists in the field. All MRI trainees are required to pass an MRI Safety Clearance before entering an affiliate center and must adhere to the company policy of the designated clinical affiliate. Clinical appointments are appointed in a first come, first serve format.

What to expect before, during, and at the conclusion of clinical training?

Clinical training is a very important step in your development as an MRI technologist and unprofessional behavior will **not be tolerated**. Our clinical affiliates share a similar interest in developing the future of our MRI labor force. To ensure a positive outcome, clinical affiliates have the ability to remove a trainee from their site, pause training, or approach them for employment. Treat this training as a live interview as many of our alumni have been hired at their clinical site for employment.

Clinical Coordination

Each Pulse Radiology MRI trainee will be assigned a personal Clinical Coordinator to help communicate, coordinate, and manage schedules and assist with clinical case submissions and verifications. Each trainee is allowed a maximum of 2 days of call out time from their training. This must be approved by your Clinical Coordinator and site manager 2 days in advance to ensure proper communication. For any emergencies, please contact our team at info@pulseradiology.com.

Uniform Policy & Identification

Please follow the uniform guidelines of the clinical site you have been designated. Sneakers are preferred. Sandals, jeans, and sweatpants are not approved footwear. Each Pulse Radiology MRI trainee will be provided a photo ID which should be worn at chest level while on an affiliate's premises. If you have not received your photo ID, please contact our team at info@pulseradiology.com.

Training at your Employer

If your employer approves your clinical training onsite, please notify your Clinical Coordinator to properly communicate schedules and expectations.

PREREQUISITES OF COURSE

- Imaging professionals registered with the American Registry of Radiologic Technologists (ARRT) includes:
 - ARRT Radiologic Technologists
 - ARRT Radiation Therapists
 - NMTCB Nuclear Medicine Technologists
 - ARDMS Sonographers
- Bachelor, Associate, or High-School degree + ARRT registration is required.
- MRI Safety Clearance completed with Pulse Radiology New Enrollment Form.

INTERNET CAPABILITIES

Pulse Radiology operates from an external, web-based e-learning platform called Teachable. For best performance, connecting to Wi-Fi would provide the best speed. The Pulse Radiology Student Portal is accessible via a desktop, laptop, tablet, or smartphone.

READING SOURCES

Pulse Radiology does not require any additional reading sources. We do provide external voluntary resources to assist in registry preparation:

- Comprehensive MRI Cross Sectional Anatomy, Neil Huber, RT(R)(MR)
 - <https://pulse-radiology.teachable.com/p/comprehensive-mri-cross-sectional-anatomy>
- MRI Physics: Tech to Tech Explanations, Stephen Powers, RT(R)(MR)
 - <https://www.amazon.com/MRI-Physics-Tech-Explanations-ebook/dp/B09166669T>
- MRI Safety Level II Personnel Training, William Faulkner & Associates
 - <https://www.t2star.com/>
- Pulse Radiology MRI Registry Review, Stephen Powers, RT(R)(MR)
 - <https://pulse-radiology.teachable.com/p/pulse-radiology-mri-registry-review>
- MRI Quiz
 - <https://www.mriquiz.com/>

POLICY ON ACADEMIC HONESTY

Academic dishonesty is a serious ethical and professional infraction. This course places high value upon educating fellow technologists, as passing a certification exam is the goal for this course. Remember that cheating and dishonesty only effects you and degrades the quality of preparation offered to you by Pulse Radiology. This course is created to be completed as a consecutive, progressive format. Each week builds fundamental content that is advanced in the following weekly modules. For best results and to minimize confusion, we require all trainees to complete this course in the consecutive weekly format outlined.

Pulse Radiology trusts that students do not infringe on the copyright law by sharing materialized information or using course information for future teaching and publishing without Pulse Radiology's written and/or verbal consent.

METHODS OF EVALUATING STUDENTS

- MRI trainees are required to complete each module to its full entirety to receive any continuing education credits which are approved by the American Society of Radiologic Technologists (ASRT).
- At the conclusion of each weekly test, MRI trainees will receive a copy of their test results to the e-mail provided during test login. You have 3 attempts to pass the weekly test with a 75% or greater.
- Evaluation of each MRI trainee will be monitored through lecture completion, weekly tests, midterm, and final Mock Registry 220.

COURSE CURRICULUM

Week 1: Welcome and Syllabus Overview

- [Syllabus: Overview of the Pulse Radiology MRI Program](#)
- [ARRT MRI Content Specifications](#)
- [ARRT MRI Clinical Requirements](#)
- [Pulse Radiology Clinical Notes](#) (printable)
- [Pulse Radiology MRI Clinical Notes](#) (printable)
- [Video: How to Print Slides](#)

Week 2: Patient Care and MRI Safety

- [Legal and Ethical Principles](#)
 - Confirmation of Exam Requisition
 - Legal Issues
 - Patient Bill of Rights
- [Level II MRI Personal Safety Training \(MRI Safety Requirement\)](#)
 - Screening and Education
 - Equipment Safety
 - MRI Environment (MRI Zones)
 - Biological Considerations
- [Patient Assessment, Monitoring and Management](#)
 - Routine Monitoring
 - Emergency Response
 - Patient Transfer and Body Mechanics
 - Assisting Patient with Medical Equipment
- [Interpersonal Communication](#)
 - Modes of Communication
 - Challenges in Patient Communication
 - Patient Education
- [Infection Control](#)
 - Terminology and Basic Concepts
 - Cycle of Infection
 - Standard Precautions
 - Additional or Transmission-Based Precautions
 - Safe Cleaning of Equipment
 - Proper Disposal of Contaminated Materials
- [MRI Burn Prevention Tips](#)
- [Tips for Scanning Patients with Implants](#)
- [Understanding MRI Labelling](#)
- [Test](#)

Week 3: Fundamentals of MRI Physics

- **Introduction to Fundamentals of MRI Physics**
- **Nuclear Magnetism**
 - Key Definitions
 - Study of Hydrogen
 - Net Magnetization and B0
 - Hydrogen vs. Magnetic Fields
 - Precessional, Resonant and Larmor Frequency
 - Larmor Equation
 - Frequency of Hydrogen
 - Understanding Typical Registry Question
- **Tissue Characteristics**
 - Key Definitions
 - Tissue Differentiation
 - Process of Excitation and Relaxation
 - Flip Angle
 - T1 Relaxation (spin-lattice)
 - T2 Relaxation (spin-spin)
 - Tissue Categories
 - Relaxation Rates
- **Spatial Localization**
 - Key Definitions
- **Precession of Protons**
- **Test**

Week 4: Instrumentation of MRI

- **Introduction to MRI Instrumentation and Hardware**
- **Electromagnetism**
 - Faraday's Law
 - Types of Magnets
 - Study of the Magnetic Field
- **Radiofrequency System**
 - RF Coil Configuration
 - Transmit and Receive Coils
 - Phase Array Coil
 - Radiofrequency Tuning
- **Gradient System**
 - Gradient Coil Configuration
 - Slew Rate
 - Rise and Fall Time
 - Duty Cycle
- **Installation of the MRI Scanner**
- **Test**

Week 5: Pulse Sequence Design

- **Introduction to Pulse Sequences**
- **Overview of Timing Diagrams**
 - Pulse Sequence Timing Diagram
 - Simple Explanation
 - Technical Explanation
 - Step-by-Step Approach to Timing Diagrams
- **Types of Pulse Sequences**
 - Conventional Spin Echo
 - Fast Spin Echo
 - What Is TI?
 - Why do we need a 180° pulse?
 - STIR
 - FLAIR
 - Conventional GRE
 - Spoiled GRE
 - Steady State GRE
 - Fast GRE
 - Echo Planar Imaging (EPI)
- **History of Magnetic Resonance Imaging**
- **MRI Vendor Acronyms**
- **Test**

Week 5: Pulse Sequence Design

- **Four Impacts of MRI Parameter**
 - Signal-to-Noise Ratio
 - Contrast-to-Noise Ratio
 - Spatial Resolution
 - Acquisition Time
 - Formulas for 2D and 3D Scan Times
 - Understanding Typical Registry Question
- **MRI Parameters**
 - Repetition Time (TR)
 - Echo Time (TE)
 - TR / TE Combinations
 - Inversion Time (TI)
 - Field of View (FOV)
 - Slice Thickness / Gap / Number of Slices
 - Matrix Size
 - Flip Angle
 - Number of Excitations / Signal Averages
 - Echo Train Length (ETL)
 - Bandwidth
 - Phase and Frequency
 - Relationships of Parameters

- **Imaging Options**
 - 2D and 3D Imaging
 - Slice Order
 - Saturation Pulse
 - Gradient Moment Nulling / Flow Compensation
 - Suppression Techniques
 - Metal Suppression
 - DIXON Technique
 - Gating and Triggering
 - Rectangular FOV
 - No Phase Wrap / Anti-Aliasing
 - Parallel Imaging
 - Motion in the Phase Direction
 - Motion Correction Techniques
 - Filtering
- **Test**

Week 7: Midterm

- **Midterm 100**
 - This midterm will be one hundred (100) question that will cover content from Weeks 1-6.

Week 8: Data Manipulation and Special Procedures

- **k-space Mapping and Filling**
 - k-space
 - k-space filling
 - Types of k-space
- **Fourier Transformation**
 - Fourier Transformation explained
- **Post-Processing**
 - Maximum Intensity Projection (MIP)
 - Multiplanar Reconstruction (MPR)
 - Isotropic vs. Anisotropic
 - Typical Registry Question
 - Subtraction
 - ADC Mapping
- **Special Procedures**
 - MRA / MRV
 - Types of MRA
 - Functional MRI Techniques
 - Perfusion
 - Spectroscopy
- **Dynamic Imaging**
 - Explanation of Dynamic Studies
- **Contrast Bolus Detection**
 - Fluoroscopic and Automatic Triggering
 - Timing Bolus
- **Test**

Week 9: Anatomy of the Head, Neck and Spine

- **Positioning, Landmarking, Protocols and Cross Sectional Anatomy**
 - Brain
 - IAC's
 - Pituitary
 - Orbits
 - Soft Tissue Neck
 - Cervical Spine
 - Thoracic Spine
 - Lumbar Spine
 - Sacrum
 - Coccyx
 - Sacroiliac Joints
- **Test**

Week 10: Anatomy of Chest and Abdomen

- **Positioning, Landmarking, Protocols and Cross Sectional Anatomy**
 - Brachial Plexus
 - Cardiac Imaging
 - MRA Aortic Arch
 - Breasts
 - Liver
 - Pancreas
 - Pancreas
 - Adrenals
 - MRCP
 - MRA Renal Arteries
 - Male and Female Soft Tissue Pelvis
 - Bony Pelvis
- **Test**

Week 11: Upper and Lower Extremities

- **Positioning, Landmarking, Protocols and Cross Sectional Anatomy**
 - Temporomandibular Joints (TMJ)
 - Shoulder
 - Elbow
 - Wrist
 - Hand
 - Finger / Thumb
 - MRA Runoff
 - Hip
 - Knee
 - Ankle
 - Midfoot
 - Forefoot
- **Test**

Week 12: MRI Artifacts

- **Recognizing and Troubleshooting MRI Artifacts**
 - Aliasing / Phase Wrap
 - Truncation
 - Gibbs Artifact
 - Chemical Shifting
 - Metallic Susceptibility
 - RF Artifact / Zipper Artifact
 - Flow Artifact
 - Motion
 - Partial Volume Averaging
 - Crosstalk
 - Moire Pattern
 - Annefact
 - IDEAL / DIXON Artifact
 - Imperfect Saturation
 - Courdoroy Artifact
- **Test**

Week 13: MRI Registry Preparation & Clinical Instructions

Clinical and Registry Instructional Preparation

- This week will focus on registry preparation by providing tutorials on how to log ARRT Clinical Requirements and your ARRT Structured Education Certificate of Completion.
- How to Submit ARRT Structured Education Certificate to your ARRT Dashboard
- How to Submit Clinical Requirements for Verification on your ARRT Dashboard
- ARRT MRI Registry Preparation and Instructions
- ARRT MRI Primary Discipline Handbook
- ARRT MRI Task Inventory
- ** Elective MRI Registry Review (not included)

Week 14: Mock MRI Registry 220

Mock MRI Registry 220

- This week is a re-calibration week to evaluate your "registry readiness" by providing a two hundred and twenty (220) question mock registry.
- **Test**



ARRT Credit Distribution

Title Pulse Radiology MRI Registry Program
Reference Number NYZ0145001
Credits 25.50 A
Approved By American Society of Radiologic Technologists
Approval Period 01/08/2016 - 02/01/2027
Is this a Textbook? No

Credit Distribution

Effective 2/2/2018

Expires 2/1/2027

DISCIPLINE	YEAR	MAJOR CONTENT CATEGORY & SUBCATEGORIES	CE CREDITS PROVIDED
MRI	2016	Patient Care	
		Patient Interactions and Management	3.00
MRI	2016	Safety	
		MRI Screening and Safety	3.00
MRI	2016	Image Production	
		Physical Principles of Image Formation	6.00
		Sequence Parameters and Options	3.75
		Data Acquisition and Processing	3.75
MRI	2016	Procedures	
		Neuro	2.00
		Body	2.00
		Musculoskeletal	2.00
MRI	2020	Patient Care	
		Patient Interactions and Management	3.00
MRI	2020	Safety	
		MRI Screening and Safety	3.00
MRI	2020	Image Production	
		Physical Principles of Image Formation	6.00
		Sequence Parameters and Options	3.75
		Data Acquisition, Processing, and Storage	3.75
MRI	2020	Procedures	
		Neurological	2.00
		Body	2.00
		Musculoskeletal	2.00

Verified completion of this activity fully satisfies ARRT's structured education requirements for individuals pursuing post-primary certification and registration in .