

## **Course Description**

## RTE2575 | MRI Principles and MRI Safety | 3.00 credits

This course is an introduction to the basic principles of MRI, including signal production, basic concepts in image formation and image contrast and resolution. It is intended to provide a solid foundation in MRI technology as well as an understanding of the MRI equipment and its appropriate and safe use. A practical approach to using the correct imaging sequences and parameters will be discussed. Emphasis will be placed in MRI Screening and MRI Safety.

## **Course Competencies**

**Competency 1:** The students will demonstrate knowledge and comprehension of basic principles of MRI by:

- 1. Explaining atomic structures, magnetic resonance, and Larmor equations
- 2. Explaining various pulse sequences, image weighting, and contrast
- 3. Identifying significant components of the MRI machine

**Competency 2:** The students will demonstrate knowledge and comprehension of Data collection, Spatial encoding, and Image formation by:

- 1. Explaining slice select, frequency, and phase encoding gradients
- 2. Explaining K- Space filling and Fast Fourier Transform (FFT)
- 3. Explaining the process of MRI data collection

**Competency 3:** The students will demonstrate knowledge and comprehension of MRI Scanning and Parameters and trade-offs by:

- 1. Explaining Signal Noise Ratio, Contrast Noise Ratio, and Spatial Resolution
- 2. Explaining various steps to minimize MRI scanning time
- 3. Explaining various pulse sequences such as spin echoes, gradient echoes, inversion recovery, and parallel imaging techniques

**Competency 4:** The students will demonstrate knowledge and comprehension of vascular and cardiac imaging by:

- 1. Explaining various types of blood flow in our body
- 2. Explaining various flow compensation techniques to avoid flow artifacts
- 3. Explaining various gating techniques used in cardiac and vascular imaging

**Competency 5:** The students will demonstrate knowledge and comprehension of MRI equipment and MRI safety by:

- 1. Explaining types of magnets, radio frequencies, shimming techniques, and computer systems. Explaining the uses of paramagnetic contrast agents in MRI to enhance image contrast
- 2. Explaining functional MRI imaging techniques
- 3. Explaining MR Safety- Devices and monitors in MRI
- 4. Explaining various MR safety guidelines used in MRI

## Learning Outcomes:

- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Use computer and emerging technologies effectively