Middlesex Community College
School of Radiologic Technology
SYLLABUS - CRN 3406

I. Course Title: **MRI*204 - MRI Image Quality, Equipment and Safety Essentials I (CRN3406)**

II. Credits: **2**

III. Prerequisites: Admissions to the Magnetic Resonance Imaging (MRI) Program, and ARRT Registered Radiographer, or Nuclear Medicine (Certification in Nuclear Medicine Technology Certification Board (NMTCB), or Radiation Therapy, or Sonography (Registration through the American Registry for Diagnostic Medical Sonography) (ARDMS).

IV. Semester: Fall 2019

V. Instructor: AnnaMaria Brancato (DiPetiro), Bsc, R.T.(R) (MR) (MRSO)
Office Hours: By appointment
Phone: 860 - 810-5827 7:30a.m. – 8:00 p.m.
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VI. Course Description: Magnetic imaging parameters are introduced. The formation of the MR signal is discussed as well as the essential components of an MR imaging system. Magnetic safety precautions that affect both patient and operator are discussed.

VII. Course Text:
MRI in Practice, 5th Ed., Westbrook,Talbot: Wiley & Sons, 2018
Handbook of MRI Scanning, Burghart,Finn: Elsevier Mosby 2011
Review Questions for MRI, Roth and Faulkner: Wiley-Blackwell 2012

VIII. Course Objectives: At the end of this course, the student will be able to:

1. Identify the major hardware components in magnetic resonance (MR) imaging.
2. Define magnetism and magnetic properties.
3. Define gauss and tesla.
4. Describe the 3 basic types of magnets.
5. Discuss the difference in low-, mid-, high-, and ultra-high-field systems.
6. Explain the functionality of the shim system in MR imaging.
7. Explain the functionality of the radiofrequency (RF) system in magnetic resonance (MR) imaging.
8. Explain the functionality of the gradient system in MR imaging.
9. Discuss how gradients alter magnetic fields.
10. Describe the role of coils when applying gradients.
11. Explain intrinsic parameters that affect image quality, such as proton density, T1 relaxation, and T2 inversion time and flip angle.
12. Explain extrinsic parameters that affect image quality, such as repetition time (RR), echo time (TE), inversion time and flip angle.
13. List the image parameters that determine image contrast.
14. Describe how imaging parameters determine spatial resolution on MR images.
15. Name the imaging parameters involved in MR image formation.
16. Explain parameters and imaging options to obtain diagnostic MR images with image artifacts.
17. Discuss the elements of safety that ensure a magnetic image resonance facility operates safely.
18. Demonstrates proper screening and preparation of patients for MR imaging.

IX. Course Goals:

Provide students with the opportunity to:

1. identify the major hardware components in magnetic resonance imaging
2. define magnetism and magnetic properties
3. define gauss and tesla
4. describe the 3 basic types of magnets
5. discuss the difference in low, mid, high, and ultra-high field systems
6. explain the functionality of the radiofrequency, gradient and shim systems in MR imaging
7. compare and contrast intrinsic and extrinsic parameters that affect image quality
8. explain parameters and imaging options to obtain diagnostic MR images with image artifacts
9. discuss the elements of safety that ensure a magnetic image resonance facility operates safely
10. demonstrates proper screening and preparation of patients for MR imaging

X. General Unit Outline:

1. Clinical Skills
    a. Practice positioning of routine and non-routine procedures.
    b. Demonstrate proficiency on different patient procedures.
2. Image analysis and critique
    a. Analyze image using acceptable established criteria
    b. Differentiate between optimum and acceptable contrast enhancement of structures per established criteria.
3. Oral and Written communications
    a. Demonstrate written documentation techniques using clinic site specific protocols
    b. Practice communication techniques based on patient's physical and mental ability.
4. Patient Care Skills
    a. Practice patient care and assessment in preparation for examinations
    b. Demonstrate appropriate contrast media usage for protocol based on established criteria.

XII. Course Presentation:

This course consists of the following components:

1. Assignments	50%
2. Quizzes	25%
3. Final Exam	25%

XIII. Grading Scale:

A = 94 - 100	B- = 81- 84	D+ = 69 -72
A- = 91 - 93	C+ = 79 - 80	D = 64-68
B+ = 88 - 90	C = 77- 78	D- = 60 - 63
B = 85 -87	C- = 73-76	F = 59 and below

A "C"* or Better is required in all Radiology and General Education Courses in Order to Progress in the Program A grade of Incomplete "I" is given in extenuating circumstances. Incomplete grades must be satisfactorily completed prior to the start of the next semester to progress in the program. Failure to meet all requirements will result in a grade of "F" and dismissal from the program. Also, a grade of "F" will be given when a student is dismissed from the program for unsafe clinical infractions.The radiography program uses a competency-based grading system. Competence is the ability of the student to demonstrate a skill or knowledge that is consistent with the standards and abilities required of an entry-level radiographer. In

radiology class work, a grade of "C" designates competence. In clinical an overall final average of "C" in ALL evaluated areas indicates competence. In addition to the overall "C" average, each clinical competency examination requires a minimum of an 80% for successful completion of the procedure.

ADDITIONAL COLLEGE INFORMATION: IMPORTANT COLLEGE POLICIES!! PLEASE READ CAREFULLY!

For information about the college's policies and procedures regarding academic honesty, accessibility/disability services, attendance, audio-recording in the classroom, grade appeals, religious accommodations, weather and emergency closings, and more, please go to the following website: https://mxcc.edu/catalog/academic-policies /

Also, please become familiar with the policies regarding nondiscrimination, sexual misconduct, and general student conduct at the following website: www.mxcc.edu/nondiscrimination/

MRI 203 MRI Instrumentation and Procedures I

Week #	Assignment(s)
1	- Safety Introduction Presentation - Presentation1_Assignment1
2	- Read Chapter 1 pgs 1-5 - Module 1 - Module1_Assignment1
3	- Module1_Assignment2 - Module1_Assignment3
4	- Module 1 Assignment Quiz - Read Chapter 10-all pages
5	- ACR White Paper (read through) - Module 7 - Module7_Assignment1
6	- Module7_Assignment2 - Module7_Assignment3
7	- Module7_ Assignment4 - Module 7 Assignment Quiz
8	- Read Chapter 4 pages 84-93 & 106-112 - Module 3 - Module3_Assignment1
9	- Read Chapter 5 pages 128-135 - Read chapter 6 pages 158-173 - Read Chapter 9 pages 330-343 - Module3_Assignment2
10	- Module3_Assignment3
11	- Module3_Assignment4 - Module3_Assignment5
12	- Module 3 Assignment Quiz

13	- **Group Discussion**
14	- **Final Exam Review Discussion**
15	- **FINAL EXAM!!!**

***SUBJECT TO CHANGE WITH/WITHOUT NOTIFICATION**

NOTES:

- During this clinical course students will be assigned rotation through different MRI areas at clinical affiliates.
- Students will be directly supervised and evaluated by a staff radiographer or program official during this clinical semester on patient interaction, communication, positioning skills and technical ability.
- Students will be required to complete any remaining procedures necessary to be eligible to sit for the national registry examination, ARRT (American Society of Radiologic Technologists)

Effective: 8//2019