

CASPER COLLEGE COURSE SYLLABUS
RDTK 1950 H1
MRI Procedures I

Semester/Year: **FA 2015**

Lecture Hours: 3

Lab Hours: 0

Credit Hours: 3

Class Time: 9-12 or 1-4.

Days: Saturday Listed: 9/12, 10/10, 11/21
Room: TBA

Instructor's Name: Misty Dibble

Instructor's Contact
Information:

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Office Hours: Please make an appointment with instructor

Course Description:

This content provides the student with imaging techniques related to the head, neck, spine, chest, thorax and abdominopelvic regions. The content covers specific clinical application, coils that are available and their use, considerations in the scan sequences, specific choices in the protocols (e.g., slice thickness, phase direction and flow compensation), and positioning criteria. Anatomical structures and the plane that best demonstrates anatomy are discussed as well as signal characteristics of normal and abnormal structures. This content outlines the critical criteria relevant to acquiring high-quality images of various anatomical regions. Due to different considerations for the various regions in the body, imaging protocols vary. The student studies the variations in imaging parameters for specific body regions and the resultant effect on signal characteristics and the anatomy represented. Evaluation criteria for determining the quality of images provides MR technologists with a better understanding of what constitutes a high-quality image. In a competency-based educational system, this content is completed prior to competency examinations. Review of appropriate patient care, contrast agents, and safety considerations while working in a magnetic field will be emphasized for each procedure.

Pathologies associated with the areas discussed in this course will be reviewed.

Statement of Prerequisites: Admission to MRI program, HTLK 2200 Cross sectional Anatomy, RDTK 1940 Introduction to MRI

Goal: The student technologist should recognize the need for additional sequences and changes in protocols based upon recognizing pathological changes. In addition, a technologist must be aware of indications that show a contrast agent is required. The knowledge of disease processes and their signal characteristics on various imaging sequences is essential to ensure the best practices in patient care and quality imaging.

1. State the coils available for MR and their specific application.
2. Describe considerations in designing an imaging protocol and state the application of protocols in specific situations.
3. Demonstrate proper patient screening.
4. Demonstrate knowledge of scanning menus, archival procedures and display functions.
5. Demonstrate proper windowing levels and widths.
6. Demonstrate proper use of MR-safe monitoring devices.
7. Demonstrate how to prepare contrast materials and use MR injectors.
8. State positioning criteria for different areas of the body.
9. State advantages and disadvantages of axial, sagittal, coronal and oblique images (i.e., what structures are best demonstrated).
10. Describe common pulse sequences used to evaluate the different areas of the body.
11. State tissue signal characteristics of anatomical structures with and without contrast.
12. Explain the use of contrast media in evaluating pathology.
13. Describe common artifacts that occur during imaging.
14. Describe the differences between adult and pediatric pulse sequences in MR.
15. Describe the differences in tissue signal characteristics between adult and pediatric examinations.
16. Describe the criteria for imaging windows for different areas of the body.
17. Describe the MR characteristics of blood as seen on arterial and venous magnetic resonance angiography (MRA).
18. Identify how field strength affects the ability to visualize select pathology.
19. Describe the MR tissue characteristics of select pathological processes.
20. Discuss saturation pulses, which help to identify arteries and veins.
21. Evaluate images for appropriate positioning, anatomy, pulse sequences and overall quality.
22. Identify the common indications and common pathology for the the abdomen, the musculoskeletal system, the soft tissue pelvis that includes the male and female reproductive systems, the chest, the heart, mediastinum, the brachial plexus and breast exams.
23. Demonstrate effective communication skills with patients, their family members and staff.
24. Demonstrate MR safety and protective practices associated with MR examinations.

25. Explain the principles of MR spectroscopy.
26. Discuss the current and future development of in vivo spectroscopic diagnosis of disease processes.
27. Discuss the hardware requirements for MR spectroscopy.
28. Describe and discuss the various imaging planes and pulse sequence parameters that maximize the diagnostic value of an MR scan of the central nervous system including the brain and spine.
29. Describe the effects of blood flow characteristics on image quality, including laminar turbulent, vortex and stationary or stagnant flow.
30. Identify common vascular lesions on MRA images.
31. Review the components of the abdomen.
32. Identify the normal anatomic location of abdominal components on diagrams and scan images.
33. Describe the normal MR tissue characteristics of the components of the abdomen.
34. Describe and discuss imaging planes and pulse sequence parameters that maximize the diagnostic value of an MR scan of the abdomen.
35. Discuss the different types of MRA procedures, when they are used and the characteristics of the resultant images.
36. Identify common pathology of the abdomen on MR images.
37. Review the anatomy of the musculoskeletal system.
38. Identify the normal anatomic location of musculoskeletal system components on diagrams and scan images.
39. Describe and discuss the imaging planes and pulse sequencing parameters that maximize the diagnostic value of an MR scan of the upper extremity, lower extremity, shoulder girdle and pelvic girdle.
40. Identify common pathological conditions seen in the musculoskeletal system on MR images.
41. Review the components of the soft tissue pelvis including the male and female reproductive systems.
42. Identify the normal anatomic location of the components of the male and female pelvis on diagrams and scan images.
43. Describe the normal MR tissue characteristics of the components of the male and female pelvis.
44. Describe and discuss imaging planes and pulse sequence parameters that maximize the diagnostic value of an MR scan of the pelvis including the male and female reproductive systems.
45. Identify common pathology of the pelvis, including the male and female reproductive systems and their tissue characteristics on MR images.

MR Pathology

1. State pathologies that commonly require an MR study.

2. Display understanding of the signal characteristics displayed by abnormal tissues during various pulse sequences and imaging modes in illustrating pathological processes.
3. Recognize changes in anatomical sizes and shapes of structures that can indicate pathology.
4. Describe basic pathological processes demonstrated by MR.
5. Identify the nature and courses of the pathologies listed in the course outline.
6. Describe the effect of contrast agents on visualizing pathology.

Methodology: Lecture, demonstration, case study

Evaluation Criteria:

Assignments 100 points each= 100 points

Quizzes 100 points each

Paper 100 points

Presentations 100 points

Final Test 100 points

Course Total: 1000 points

Grade Scale: Grade percentage scale:

A = 92-100
B = 83- 91
C = 75- 82
F = 0- 74

Required Text, Readings, and Materials:

1. Handbook of MRI Technique, Catherine Westbrook, Wiley-Blackwell, 3rd ed. 2008
2. Handbook of MRI Scanning, Geraldine Burghart, Elsevier, 2011
3. CT and MRI Pathology; A Pocket Atlas, Michael Grey

Class Policies: Last Date to Change to Audit Status or to Withdraw with a W Grade:

Student Rights and Responsibilities: Please refer to the Casper College Student Conduct and Judicial Code for information concerning your rights and responsibilities as a Casper College Student.

Chain of Command: If you have any problems with this class, you should first contact the instructor to attempt to solve the problem. If you are not satisfied with the solution offered by the instructor, you should then take the matter through the appropriate chain of command starting with the Department Head/Program Director, the Dean, and lastly the Interim Vice President for Academic Affairs.

Academic Dishonesty - Cheating & Plagiarism: Casper College demands intellectual honesty. Proven plagiarism or any form of dishonesty associated with the academic process can result in the offender failing the course in which the offense was committed or expulsion from school. See the Casper College Student Code of Conduct.

Official Means of Communication: Casper College faculty and staff will employ the student's assigned Casper College email account as a primary method of communication. Students are responsible to check their account regularly.

ADA Accommodations Policy: If you need academic accommodations because of a disability, please inform me as soon as possible. See me privately after class, or during my office hours. To request academic accommodations, students must first consult with the college's Disability Services Counselor located in the Gateway Building, Room 344, (307) 268-2557, bheuer@caspercollege.edu. The Disability Services Counselor is responsible for reviewing documentation provided by students requesting accommodations, determining eligibility for accommodations, and helping students request and use appropriate accommodations.

Calendar or schedule indicating course content:

Each area will contain the following content:

1. Anatomy and Physiology: Imaging planes, pathological considerations, protocol considerations.
2. Contrast: Type of agent, contraindications, dose calculations, administration route, effects on image.
3. Patient Positioning: Coil selection, patient orientation, land marking, physiologic gating and triggering, calibration scans

On Campus class Days: 9/12; 10/10; 11/21



Topic 1

August 25-Sept. 1

Due Date: Sept. 1

Read the article linked below entitled: The American College of Radiology Guidance Document of Safe MR Practices.

Go to the assignment link and write a paper which includes the information listed.

- [ACR Article Review Assignment](#)
-  [American College of Radiology Guidance Document to Safe MR Practices file](#)
- [MRI Accident with Oxygen URL](#)
- [MRI Safety Website URL](#)
-  [American College of Radiology MR Safe Practice Article File](#)

Topic 2

Sept. 3-15

Due Date Sept. 15 th

On Campus Class September 12th Review Head and Neck

Head and Neck:

Section to cover: Brain, Temporal Lobes, Posterior Fossa, Internal Auditory Meati, Pituitary Fossa, Orbits, Paranasal Sinuses, Pharynx, Larynx, Thyroid and Parathyroid Glands, Temporomandibular Joints, Vascular Imaging




Required References:

1. Handbook of MRI Technique. Chapter 8

2. CT and MRI Pathology; A Pocket Atlas. Pages 6-90, Pages 136-161

3. Handbook of MRI Scanning Ch. 1

4. Review Study Guides inserted below covering terminology, other common exams and pathology.

- Study Guide: Anatomy and Pathology Cranium and Facial Bones Assignment
- Study Guide: Terminology and Pathology of the Brain Assignment
- Study Guide: Terminology and Pathology of the Neck Assignment
-  STUDY GUIDE FOR FACIAL BONES File
-  STUDY GUIDE FOR PATHOLOGY OF HEAD File
-  STUDY GUIDE FOR PATHOLOGY OF NECK File

Topic 3

Continued from Topic 2

Test covering Head, Brain and Neck Anatomy, Pathology and Procedure.

Use the references listed above in section 4 in conjunction with your CT/MRI Pathology, Handbook of Scanning Techniques, and Handbook of MRI Technique books to complete these quizzes.

Start date: Sept. 3, 2015

Due date: Sept. 15, 2015

- [Brain Test Quiz](#)
 - [Neck Test Quiz](#)
 - [Test Cranium and Facial Bones Quiz](#)
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Topic 4

September 16- September 29th

Section to cover: Cervical, Thoracic, Lumbar, Whole Spine Imaging

Required References:

1. Handbook of MRI Technique. Chapter 9
2. CT and MRI Pathology; A Pocket Atlas. Pages 90-133
3. Handbook of MRI Scanning Chapter 2
4. Review Study Guide covering terminology, other common exams and pathology.

- [Study Guide: Terminology and Pathology of the Spine Assignment](#)
 -  [STUDY GUIDE FOR SPINE File](#)
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Topic 5

Continued from Topic 4

September 16- September 29th

Due Date September 29th

Quiz must be taken by September 29th

Test covering spine anatomy, procedures and pathology.

Use the references listed in Topic 4 to study for this test.

Due: September 11:55 pm

- [Spine Test Quiz](#)

Topic 6

Neuroimaging Module

Sep. 3rd- Oct. 13th,

Due date Oct. 13th

Quiz Due Oct 13th

Module: Neuroimaging to include the Brain and Spine

Module takes a minute to load, please be patient.

Watch module: Be sure to take detailed notes to use for quiz.

Quiz: Take quiz covering the Brain and Spine 100 Points

- [Neuroimaging to include the Brain and Spine Quiz](#)
- [Module: MRI Neuro Imaging URL](#)

Topic 7

October 14-27th,

Due Date: Oct. 27th.

Chest/Thorax:

Section covers: Lungs, Mediastinum, Heart, Great Vessels, Thymus, Breast, Axilla, Brachial Plexus

Required References:

1. Handbook of MRI Technique. Chapter 10

2. CT and MRI Pathology; A Pocket Atlas Pages 164-217

3. Handbook of MRI Scanning Chapter 5

4. Review Study Guide covering terminology, other common exams and pathology.

- Study Guide: Terminology and Pathology of the Thorax Assignment
-  STUDY GUIDE: TERMINOLOGY AND PATHOLOGY OF THORAX File

Topic 8

Continued from Topic 7

October 14- October 27

Due Date October 27th

Test chest and thorax anatomy, pathology and procedures

Use the reference materials listed in section 9 to study for this test.

TEST Chest/thorax Due Date: Oct. 27TH.

- Test Chest and Thorax Quiz

Topic 9

Oct. 28-Nov. 3

Abdomen:

Section Covers: Liver, Biliary System, Kidneys, Adrenal Glands, Pancreas, Peritoneum, Retroperitoneum, Vascular Imaging

Required References:

1. Handbook of MRI Technique. Chapter 11

2. CT and MRI Pathology; A Pocket Atlas Pages 220-333

3. Handbook of MRI Scanning Chapter 6

4. Review Study Guide covering terminology, other common exams and pathology.

- [Study Guide: Terminology and Pathology of the Abdomen Assignment](#)
 -  [STUDY GUIDE: TERMINOLOGY AND PATHOLOGY OF ABDOMEN File](#)
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Topic 10

Continued from Topic 9

Oct 28 - Nov. 3rd

Due date: Nov. 3rd

Test covering abdomen MRI anatomy, pathology and procedures.

Use the reference material listed in Topic 9 to study for this test.

- [Test Abdomen Quiz](#)
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Topic 11

November 21th- Presentations in class

Final Project: Case Study Pathology Presentations

Each student will present two pathologies approved by the instructor

Areas Include:	ROB
Head/Neck	CHRIS
Spine	HEATHER
Chest/Thorax	JOEY
Abdomen	JACOB
Pelvis	DREW

- [Final Project Case Study Presentations Assignment](#)

Topic 12

Nov. 4th - Nov. 17th

Pelvis

Section Covers: Male Pelvis, Female Pelvis, Obstetrics, Reproductive System.

Required References:

1. Handbook of MRI Technique. Chapter 12

2. CT and MRI Pathology; A Pocket Atlas Pages 336-349

3. Handbook of MRI Scanning Chapter 6

4. Review Study Guide covering terminology, other common exams and pathology.

- [Study Guide: Terminology and Pathology of the Pelvis Assignment](#)
-  [STUDY GUIDE: TERMINOLGOY AND PATHOLOGY OF PELVIS File](#)

Topic 13

Test covering Pelvis anatomy, pathology and procedure.

Use the reference material listed in Topic12 to study for this test

Nov 4th- 17th

Due Date: Nov. 17th

- [Test Pelvis Quiz](#)

Topic 14

Nov 18th- Dec. 2nd

Due Date December 2nd

Module: Body and Joint Imaging to include: Thorax, Abdomen, Pelvis, Reproductive System

Module takes a minute to load, please be patient.

Watch module: Be sure to take detailed notes to use for quiz.

Quiz: Take quiz covering this section 100 points

Start reading Upr extremity--test will follow next semester.

1. Handbook of MRI technique Chapter 13.

2. CT and MRI pathology: pages 214-220

3. Handbook of MRI scanning: Chapter 3

- Quiz: Body and Joint Imaging: Thorax, Abdomen, Pelvis, Reproductive System
- Module: MRI Body/Joint Imaging URL

Topic 15

December 7-10

Due Date: Dec 10

Final Comprehensive Exam

- Final Exam Quiz