

Washtenaw Community College Comprehensive Report

MRI 130 MRI Physics II Effective Term: Fall 2022

Course Cover

College: Health Sciences

Division: Health Sciences

Department: Allied Health

Discipline: Magnetic Resonance Imaging

Course Number: 130

Org Number: 15600

Full Course Title: MRI Physics II

Transcript Title: MRI Physics II

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Three Year Review / Assessment Report

Change Information:

Consultation with all departments affected by this course is required.

Course description

Outcomes/Assessment

Objectives/Evaluation

Rationale: Update syllabus to meet requirements for updated program.

Proposed Start Semester: Winter 2022

Course Description: In this course, students will learn advanced physical principles of Magnetic Resonance Imaging (MRI). Topics include maximum intensity projection image formation, diffusion and perfusion, fundamentals of flow (including types of flow), flow motion correction and vascular imaging. Students will discuss imaging parameters, imaging options and tradeoff as well as artifacts and compensations. Parallel imaging, MR spectroscopy, and dynamic contrast enhancement will also be covered.

Course Credit Hours

Variable hours: No

Credits: 3

Lecture Hours: Instructor: 45 Student: 45

Lab: Instructor: 0 Student: 0

Clinical: Instructor: 0 Student: 0

Total Contact Hours: Instructor: 45 Student: 45

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Requisites

Prerequisite minimum grade "C"

MRI 110 MRI Physics I

Enrollment Restrictions

Admission to Magnetic Resonance Imaging (MRI) program.

General Education

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Recognize the mechanisms of flow.

Assessment 1

Assessment Tool: Outcome-related questions on the department final exam

Assessment Date: Spring/Summer 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of the students will score 70% or higher on the outcome-related questions.

Who will score and analyze the data: Departmental faculty

2. Identify imaging options used to obtain diagnostic magnetic resonance (MR) images.

Assessment 1

Assessment Tool: Outcome-related questions on the department final exam

Assessment Date: Spring/Summer 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of the students will score 70% or higher on the outcome-related questions.

Who will score and analyze the data: Department faculty

3. Identify the principles of spatial localization and k-space filling.

Assessment 1

Assessment Tool: Outcome-related questions on the department final exam

Assessment Date: Spring/Summer 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of the students will score 70% or higher on the outcome-related questions.

Who will score and analyze the data: Departmental faculty

4. Recognize the appearance and cause of artifacts associated with Magnetic Resonance Imaging (MRI).

Assessment 1

Assessment Tool: Outcome-related questions on the department final exam

Assessment Date: Spring/Summer 2024

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Answer key

Standard of success to be used for this assessment: 70% of the students will score 70% or higher on the outcome-related questions.

Who will score and analyze the data: Departmental faculty

Course Objectives

1. Describe the imaging option best used to display flow direction and velocity.
2. Describe the four types of flow within the body and identify clinical imaging effects of flow.
3. Explain of the use of spin echo imaging and gradient echo imaging to produce bright blood and black blood diagnostic MR images.
4. Explain time of flight and phase contrast pulse sequences used in magnetic resonance angiography.
5. Recognize image artifact(s), their cause(s) and possible remedies.
6. Optimize acquisition parameters to reduce artifacts.
7. Differentiate pre-saturation pulses from field of view saturation pulses.
8. Describe spectral and chemical saturation techniques.
9. Determine when to apply gradient moment nulling in the clinical setting.
10. Determine when to swap phase and frequency in the clinical setting.
11. Explain the concepts of phase shift and chemical shift.
12. Determine when to apply magnetization transfer to the imaging pulse sequence.
13. Describe how imaging parameters, such as, minimum and minimum full echo time, partial averaging, and interpolation affect k-space filling.
14. Discuss the basic principles of magnetic resonance imaging spectroscopy and Hunter's angle.

New Resources for Course

Course Textbooks/Resources

Textbooks

Westbrook, C., & Talbot, J. *MRI in Practice*, 5 ed. Wiley-Blackwell, 2019, ISBN: 9781119392002.

Manuals

Periodicals

Software

Equipment/Facilities

Other: Virtual classroom

| <u>Reviewer</u> | <u>Action</u> | <u>Date</u> |
|---|---------------------------|---------------------|
| Faculty Preparer: <i>Catherine Blaesing</i> | <i>Faculty Preparer</i> | <i>Dec 13, 2021</i> |
| Department Chair/Area Director: <i>Kristina Sprague</i> | <i>Recommend Approval</i> | <i>Dec 17, 2021</i> |
| Dean: <i>Shari Lambert</i> | <i>Recommend Approval</i> | <i>Jan 10, 2022</i> |
| Curriculum Committee Chair: <i>Randy Van Wagnen</i> | <i>Recommend Approval</i> | <i>Feb 16, 2022</i> |
| Assessment Committee Chair: <i>Shawn Deron</i> | <i>Recommend Approval</i> | <i>Feb 23, 2022</i> |
| Vice President for Instruction: <i>Kimberly Hurns</i> | <i>Approve</i> | <i>Feb 23, 2022</i> |

Washtenaw Community College Comprehensive Report

MRI 130 MRI Physics II Effective Term: Fall 2015

Course Cover

Division: Math, Science and Health

Department: Allied Health

Discipline: Magnetic Resonance Imaging

Course Number: 130

Org Number: 15600

Full Course Title: MRI Physics II

Transcript Title: MRI Physics II

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: New Course

Change Information:

Rationale: This is a required course for the Magnetic Resonance Imaging (MRI) curriculum.

Proposed Start Semester: Winter 2016

Course Description: In this course, students learn advanced physical principles of Magnetic Resonance Imaging (MRI). Topics include maximum intensity projection image formation, diffusion and perfusion, fundamentals of flow including types of flow, flow motion correction, vascular imaging, imaging parameters and tradeoff, artifacts and compensations.

Course Credit Hours

Variable hours: No

Credits: 3

Lecture Hours: Instructor: 45 **Student:** 45

Lab: Instructor: 0 **Student:** 0

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 45 **Student:** 45

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Requisites

Prerequisite minimum grade "C"

MRI 110 MRI Physics I

Enrollment Restrictions

Admission to Magnetic Resonance Imaging (MRI) program.

General Education

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Recognize the mechanisms of flow.

Assessment 1

Assessment Tool: Department final exam

Assessment Date: Winter 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All Students

How the assessment will be scored: answer key

Standard of success to be used for this assessment: 80% of the students will score 70% or higher on the outcome related questions.

Who will score and analyze the data: Departmental Faculty

2. Recognize the appearance and cause of artifacts associated with Magnetic Resonance Imaging (MRI).

Assessment 1

Assessment Tool: Department final exam

Assessment Date: Winter 2019

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All Students

How the assessment will be scored: answer key

Standard of success to be used for this assessment: 80% of the students will score 70% or higher on the outcome related questions.

Who will score and analyze the data: Departmental Faculty

Course Objectives

1. Describe the imaging option best used to display flow direction and velocity.

Matched Outcomes

2. Describe the four types of flow within the body and identify clinical imaging effects of flow.

Matched Outcomes

3. Explain of the use of spin echo imaging and gradient echo imaging to produce bright blood and black blood diagnostic MR images.

Matched Outcomes

4. Explain time of flight and phase contrast pulse sequences used in magnetic resonance angiography.

Matched Outcomes

5. Determine the cause(s) of artifacts.

Matched Outcomes

6. Optimize acquisition parameters to reduce artifacts.

Matched Outcomes

7. Differentiate pre-saturation pulses from in field of view saturation pulses.

Matched Outcomes

8. Describe spectral and chemical saturation techniques.

Matched Outcomes

9. Determine when to apply gradient moment nulling in the clinical setting.

Matched Outcomes

10. Determine when to swap phase and frequency in the clinical setting.

Matched Outcomes

11. Explain the concepts of phase shift and chemical shift.

Matched Outcomes

12. Determine when to apply magnetization transfer to the imaging pulse sequence.

Matched Outcomes

New Resources for Course

Course Textbooks/Resources

Textbooks

Westbrook, C., Roth C., & Talbot, J. *MRI in Practice*, 4 ed. Wiley-Blackwell, 2011, ISBN: 9781444337433.

Roth, Carolyn. *Volume 1 Basic & Advanced Principles of MRI: MRI Review Program for Technologists*, ed. Imaging Education Associates & Bracco Diagnostics, Inc, 2001, ISBN: 9780971225008.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Testing Center

| <u>Reviewer</u> | <u>Action</u> | <u>Date</u> |
|---|---------------------------|---------------------|
| Faculty Preparer: <i>Connie Foster</i> | <i>Faculty Preparer</i> | <i>Nov 18, 2014</i> |
| Department Chair/Area Director: <i>Connie Foster</i> | <i>Recommend Approval</i> | <i>Nov 18, 2014</i> |
| Dean: <i>Kristin Brandemuehl</i> | <i>Recommend Approval</i> | <i>Nov 19, 2014</i> |
| Vice President for Instruction: <i>Bill Abernethy</i> | <i>Approve</i> | <i>Jan 05, 2015</i> |