# http://www.ric.edu/webcommunications/images/SealWithText_Small_Black.pngUNDERGRADUATE CURRICULUM COMMITTEE (UCC)PROPOSAL FORM

## Cover page scroll over blue text to see further important [instructions](#instructions): [if not working select “COMMents on rollover” in your Word preferences under view] please read these.

**N.B. DO NOT USE HIGHLIGHT, where choices are given within categories, please DELETE those THAT DO NOT APPLY TO YOUR PROPOSAL. Do not delete numbered categories.**

**ALL numbers in section (A) to be completed, including the impact ones (#5-7), put “none” if that is the case.**

|  |  |  |
| --- | --- | --- |
| A.1. [Course or program](#Proposal) | **MRI 304 Physical Principles I** |  |
| [Replacing](#Ifapplicable)  |  |
| A.2. [Proposal type](#type) | **Course: creation** |
| A.3. [Originator](#Originator) | **Eric Hall** | [Home department](#home_dept) | **Biology/Health Sciences** |
| A.4. [Context and Rationale](#Rationale)  | **In this reorganization of the medical imaging program, new courses are being developed to cover the depth and breadth of content needed for certification as an MRI technologist.** |
| A.5. [Student impact](#student_impact) | **Improved readiness for working in the hospital or clinical environment** |
| A.6. [Impact on other programs](#impact)  | **None** |
| A.7. [Resource impact](#Resource) | [*Faculty PT & FT*](#faculty):  | **This course will be taught by LSMI faculty.** |
| [*Library*:](#library) | **None** |
| [*Technology*](#technology) | **None** |
| [*Facilities*](#facilities): | **None** |
| A.8. [Semester effective](#Semester_effective) | **Fall 2020** | A.9. [Rationale if sooner than next Fall](#Semester_effective) |  |
| A.10. INSTRUCTIONS FOR CATALOG COPY: This single file copy must include ALL relevant pages from the college catalog, and show how the catalog will be revised. (1) Go to the “Forms and Information” page on the UCC website. Scroll down until you see the Word files for the current catalog. (2) Download ALL catalog sections relevant for this proposal, including course descriptions and/or other affected programs. (3) Place ALL relevant catalog copy into a single file. Put page breaks between sections and **delete any catalog pages not relevant for this proposal**. (4) Using the track changes function, revise the catalog pages to demonstrate what the information should look like in next year’s catalog. (5) Check the revised catalog pages against the proposal form, especially making sure that program totals are correct if adding/deleting course credits. If new copy, indicate where it should go in the catalog. If making related proposals a single catalog copy that includes all is acceptable. Send as a separate single file along with this form. |

B. [NEW OR REVISED COURSES](#delete_if)  **DO NOT use highlight. Do not delete numbered categories, just leave blank if they do not apply. Delete this whole page if the proposal does not include a new or revised course. Always fill in b. 1 and B. 3 for context.**

|  | Old ([for revisions only](#Revisions))ONLY include information that is being revised, otherwise leave blank.  | NewExamples are provided within some of the boxes for guidance, delete just the examples that do not apply. |
| --- | --- | --- |
| B.1. [Course prefix and number](#cours_title)  |  | **MRI 304** |
| B.2. Cross listing number if any |  |  |
| B.3. [Course title](#title)  |  | **MRI Physical Principles I** |
| B.4. [Course description](#description)  |  | Students learn about MR signal production, tissue characteristics, pulse sequences, image formation, and image contrast. In addition, the physics of MRI and image formation and safety are studied. |
| B.5. [Prerequisite(s)](#prereqs) |  | Acceptance into a Medical Imaging clinical program |
| B.6. [Offered](#Offered) |  | **Spring** |
| B.7. [Contact hours](#contacthours)  |  | **4** |
| B.8. [Credit hours](#credits) |  | **4** |
| B.9. [Justify differences if any](#differences) |  |
| B.10. [Grading system](#grading)  |  | **Letter grade**  |
| B.11. [Instructional methods](#instr_methods) |  | **Lecture** |
| B.12.[Categories](#required) |  | **Required for major**  |
| B.13. Is this an Honors course? |  | **NO** |
| B.14. [General Education](#ge)N.B. Connections must include at least 50% Standard Classroom instruction. |  | **NO |****category:** |
| B.15. [How will student performance be evaluated?](#performance) |  | **Exams** **Assignments****Quizzes** |
| B.16 [Recommended class-size](#class_size" \o "Check appendix XVIII in the UCC Manual for Best Practices) |  | **24** |
| B.17. [Redundancy statement](#competing) |  | **N/A** |
| B. 18. Other changes, if any |  |

| B.19**.** [**Course learning outcomes**](#outcomes)**: List each one in a separate row** | [**Professional Org.Standard(s)**](#standards)**, if relevant** | [**How will each outcome be measured**](#measured)**?** |
| --- | --- | --- |
| The student will:* Understand encoding in the image formation process as it applies to; gradients slice selection, frequency encoding, phase encoding, and sampling.
* Describe and understand image formation as it applies to K-space, K-space filling, and FFT.
* Describe the important facts of K-space.
* Explain K-space traversal and gradients, options that fill k-space, and types of acquisition.
* Describe advanced pulse sequences (Steady state and echo formation, coherent gradient echo, incoherent gradient echo, steady state free precession, balanced gradient echo, fast gradient echo, single shot imaging technique, and parallel imaging).
* Understand magnetism and magnetic properties.
* Define gauss, Tesla, and the electromagnetic spectrum.
* Describe field strength in relation to image quality (image contrast, SNR, and artifacts).
* Explain the functionality of the RF system in MR imaging.
* Explain the functionality of the gradient system in MR imaging.
* Explain the functionality of the shim system in MR imaging.
* Describe imaging parameters that determine image contrast.
* Describe imaging parameters that determine spatial resolution on MR images.
* Apply MR imaging parameters in the clinical setting.
* Describe many typical imaging options used to optimize image quality.
* Understand parameters and imaging options to obtain diagnostic MR images with minimal image artifacts.
* Describe the various nuclei in a magnetic field.
* Explain how an image is acquired in MRI (nuclei in a magnetic field, excitation, relaxation).
* Explain how an MR signal is produced and detected.
* Explain MR tissue characteristics, such as spin density, T1, and T2 relaxation.
* Understand the behavior of various nuclei in the magnetic field and/ or during the application of the radio frequency pulse.
* Understand the concept of relaxation in MR.
* Apply the principle of pulse sequences and image formation to appropriate clinical applications.
* Describe and apply the imaging parameters and options available to the user for optimal MR imaging.
* Explain intrinsic parameters that affect image quality such as: MR tissue characteristics that include spin density, T1, and T2 relaxation.
* Explain extrinsic parameters that affect image quality such as: TR, TE, T1, flip angle and lesser used parameters such as b value.
* Apply the principles of pulse sequences and timing diagrams in MR.
* Define the use of gradient and RF pulses in acquiring MR images.
* Understand the concepts of image formation in MR.
* Describe scan time and the associated parameters.
* Select the appropriate pulse sequence for clinical application.
* Describe image contrast appearance according to image weighting.
 |  | Examination, , Class assignments and Quizzes |

| B.20. [**Topical outline**](#outline)**: DO NOT INSERT WHOLE SYLLABUS, JUST A TWO-TIER TOPIC OUTLINE. Proposals that ignore this request will be returned for revision.** |
| --- |
| 1. Atomic structure
	1. MR active nuclei
	2. hydrogen nucleus
	3. alignment, precession, and Larmor Equation
2. Resonance
	1. MR signal
	2. FID
	3. Relaxation
	4. T1 recovery, T2 decay, and pulse timing parameters.
3. Image contrast
	1. T1 and T2 contrast
	2. PD density, weighting, and T2\* decay
4. Pulse sequence Image weighting
	1. Gradients
	2. Slice selection, frequency and phase encoding
	3. Sampling
5. K Space
	1. Filling technieques
	2. Facts and FFT
6. SNR, CNR, and Resolution
	1. Parameters
	2. Scan time
	3. Trade-offs
	4. Volume Imaging
7. Pulse Sequences
	1. Spin echo, conventional, turbo, IR, fast IR, STIR, FLAIR, IR
	2. Gradient pulse sequences, conventional gradient echo, steady state, coherent/incoherent gradient
	3. SSFP, balanced gradient, fast gradient, SS, parallel imaging
8. Pulse Sequence Timing Diagrams
	1. Identifying phase, frequency and slice encoding gradients

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D. Signatures

* Changes that affect General Education in any way MUST be approved by ALL Deans and COGE Chair.
* Changes that directly impact more than one department/program MUST have the signatures of all relevant department chairs, program directors, and their relevant dean (e.g. when creating/revising a program using courses from other departments/programs). Check UCC manual 4.2 for further guidelines on whether the signatures need to be approval or acknowledgement.
* Proposals that do not have appropriate approval signatures will not be considered.
* Type in name of person signing and their position/affiliation.
* Send electronic files of this proposal and accompanying catalog copy to curriculum@ric.edu and a printed signature copy of this whole form to the current Chair of UCC. Check UCC website for due dates.

##### D.1. Approvals: required from programs/departments/deans who originate the proposal. may include multiple departments, e.g., for joint/interdisciplinary proposals.

| Name | Position/affiliation | [Signature](#_Signature" \o "Insert electronic signature, if available, in this column) | Date |
| --- | --- | --- | --- |
| Eric Hall | Program Director of Medical Imaging | e-mail confirmation to curriculum@ric.edu | 4/1/2020 |
| Eric Roberts | Chair of Biology | e-mail confirmation to curriculum@ric.edu | 4/1/2020 |
| Earl Simson | Dean of FAS | e-mail confirmation to curriculum@ric.edu | 4/6/2020 |

##### D.2. [Acknowledgements](#acknowledge): REQUIRED from OTHER PROGRAMS/DEPARTMENTS (and their relevant deans if not already included above) that are IMPACTED BY THE PROPOSAL. SIGNATURE DOES NOT INDICATE APPROVAL, ONLY AWARENESS THAT THE PROPOSAL IS BEING