



**ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM**

COLLEGE OF SCIENCE

Chester F. Carlson Center for Imaging Science

NEW COURSE: COS-IMGS-733 – Medical Imaging Systems

1.0 Course Approvals

Required course approvals:	Approval request date:	Approval granted date:
Academic Unit Curriculum Committee	8/16/10	9/15/10
College Curriculum Committee	9/28/2011	10/12/11

Optional designations:	Is designation desired?	*Approval request date:	**Approval granted date:
General Education:	No		
Writing Intensive:	No		
Honors	No		

2.0 Course information:

Course title:	Medical Imaging Systems
Credit hours:	3
Prerequisite(s):	COS-IMGS-616 and COS-IMGS-682, or permission of instructor
Co-requisite(s):	None
Course proposed by:	María Helguera
Effective date:	Fall 2013

	Contact hours	Maximum students/section
Classroom	3	20
Lab		
Studio		
Other (specify)		

2.1 Course Conversion Designation (Please check which applies to this course)

x	Semester Equivalent (SE) Please indicate which quarter course it is equivalent to: 1051-812 Medical Imaging Systems
	Semester Replacement (SR) Please indicate the quarter course(s) this course is replacing:
	New

2.2 Semester(s) offered (check)

Fall	Spring X	Summer	Other
------	----------	--------	-------

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here: X

2.3 Student Requirements

Students required to take this course: Graduate students pursuing the specialization track in medical imaging

Students who might elect to take the course: Graduate students pursuing the specialization track in medical imaging and other Imaging Science graduate students. Engineering students interested in medical imaging systems.

3.0 Goals of the course (including rationale for the course, when appropriate):

To introduce the physics, instrumentation and signal processing methods used in different imaging modalities such as X-ray CT, MRI, PET/SPECT and ultrasound.

4.0 Course description

IMGS-733	Medical Imaging Systems
This course is an introduction to the physics, instrumentation, and signal processing methods used in different imaging modalities such as X-ray CT, MRI, PET/SPECT and ultrasound. (COS-IMGS-616 and COS-IMGS-682, or permission of instructor) Class 3, Credit 3 (S, alternate years)	

5.0 Possible resources (texts, references, computer packages, etc.)

Prince and Links, *Medical Imaging Signals and Systems*, Prentice Hall, Upper Saddle River, NJ

6.0 Topics (outline):

- 6.1 Radiographic imaging
 - 6.1.1 Physics of radiography
 - 6.1.2 Projection radiography
- 6.2 X-ray Computerized Tomography
 - 6.2.1 Instrumentation
 - 6.2.2 Image formation
 - 6.2.3 Image quality and artifacts
- 6.3. Magnetic Resonance Imaging
 - 6.3.1 Physics of MRI
 - 6.3.2 Acquisition protocols
 - 6.3.3 Image contrast
 - 6.3.4 Image quality and artifacts
- 6.4. Emission Computed Tomography
 - 6.4.1 Physics of PET
 - 6.4.2 Physics of SPECT
 - 6.4.3 Radiotracers and tracer production
 - 6.4.4 Image reconstruction

6.4.5 Image quality and artifacts 6.5 Ultrasound 6.5.1 Instrumentation 6.5.2 Image formation

7.0 Intended course learning outcomes and associated assessment methods of those outcomes

Course Learning Outcome	Homework	Exams
7.1 Describe the physical principles of X-ray imaging	X	
7.2 Describe the physical principles and mathematical foundation of Computed Tomography	X	
7.3 Describe the physical principles and mathematical foundation of Magnetic Resonance Imaging	X	X
7.4 Describe the physical principles and mathematical foundation Nuclear medicine	X	
7.5 Describe the physical principles of Ultrasound Imaging	X	X

8.0 Program outcomes and/or goals supported by this course

8.1 Students gain an understanding of medical imaging systems and signal processing. 8.2 Prepares students with the education necessary to pursue careers in industry or to proceed to graduate research in imaging-related disciplines.

9.0

	General Education Learning Outcome Supported by the Course	Assessment Method
<i>Communication</i>		
	Express themselves effectively in common college-level written forms using standard American English	
	Revise and improve written and visual content	
	Express themselves effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing)	
	Comprehend information accessed through reading and discussion	
<i>Intellectual Inquiry</i>		
	Review, assess, and draw conclusions about hypotheses and theories	
	Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions	
	Construct logical and reasonable arguments that include anticipation of counterarguments	
	Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information	
<i>Ethical, Social and Global Awareness</i>		
	Analyze similarities and differences in human experiences and consequent perspectives	
	Examine connections among the world's populations	
	Identify contemporary ethical questions and relevant stakeholder positions	
<i>Scientific, Mathematical and Technological Literacy</i>		
	Explain basic principles and concepts of one of the natural sciences	
	Apply methods of scientific inquiry and problem solving to contemporary issues	
	Comprehend and evaluate mathematical and statistical information	
	Perform college-level mathematical operations on quantitative data	
	Describe the potential and the limitations of technology	
	Use appropriate technology to achieve desired outcomes	
<i>Creativity, Innovation and Artistic Literacy</i>		
	Demonstrate creative/innovative approaches to course-based assignments or projects	
	Interpret and evaluate artistic expression considering the cultural context in which it was created	

10.0 Other relevant information (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

Smart classroom
