ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

Chester F. Carlson Center for Imaging Science

NEW COURSE: COS-IMGS-722 - Remote Sensing: Systems, Sensors, and Radiometric Image Analysis

1.0 Course Approvals

Required course approvals:	**Approval request date:**	**Approval granted date:**
Academic Unit Curriculum Committee	9/15/2010	9/20/2010
College Curriculum Committee	9/28/2011	10/11/2011

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:	Remote Sensing: Systems, Sensors, and Radiometric Image Analysis
Credit hours:	3
Prerequisite(s):	IMGS-619 or permission of instructor
Co-requisite(s):	None
Course proposed by:	John Schott
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: 1051-762 Remote Sensing: Sensors, and Radiometric Image Analysis
	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:

2.3 Student Requirements

Students required to take this course: Graduate students in Imaging Science Remote Sensing track

Students who might elect to take the course:
Non-matriculated students with undergraduate degrees in the Physical Sciences or Engineering with permission of Instructor. Graduate students in the College of Science or College of Engineering.

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

3.1 Learn radiometric and multispectral analysis of remotely sensed images and quantitative sensing systems.
3.2 Conduct quantitative analysis of multispectral remotely sensed images.

4.0 Course description

IMGS-722 Remote Sensing: Systems, Sensors, and Radiometric Image Analysis
This course introduces the governing equations for radiance reaching an aerial or satellite based imaging systems. The course also covers the properties of these imaging systems with an emphasis on their use as quantitative scientific instruments. It also includes a treatment of methods to invert the remotely sensed image data to measurements of the Earth's surface (e.g. reflectance and temperature) through various means of inverting the governing radiometric equation. The emphasis is on multidimensional image analysis (e.g., multispectral, polarimetric, and multidate) and includes issues such as image registration to support image analysis. Based on the previous treatment, the parameters and processes governing spatial, spectral, and radiometric image fidelity are studied with an emphasis on how each step in the image chain impacts the final image or image product. (IMGS-619 or permission of instructor) **Class 3, Credit 3 (S)**

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

Schott, *Remote Sensing: The Image Chain Approach,* Oxford University Press, New York, NY.

6.0 Topics (outline):

6.1 What is Remote Sensing?
6.2 Photo Interpretation/Photogrammetry
6.3 Radiation Propagation and the Governing Equation
- 6.3.1 Solar
- 6.3.2 Thermal
- 6.3.3 Incorporation of Sensor Response

6.4 Sensing Systems
- 6.4.1 Multispectral

6.4.2 Imaging Spectrometers
6.4.3 Calibration Issues
6.4.4 Sensor Case Study
6.5 Atmospheric Compensation
6.5.1 Thermal
6.5.2 Reflective
6.5.3 Compensation of Imaging Spectrometers
6.6 Selected Topics in Image Processing
6.6.1 Texture Measurements
6.6.2 Image Restoration
6.7 Multispectral Remote Sensing
6.7.1 Review of Matrix Methods
6.7.2 Image Classification
6.7.3 Image Transforms
6.8 Image/Data Combination and Information Dissemination
6.8.1 GIS Concepts
6.8.2 Image Fusion

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

Course Learning Outcome	**Homework**	**Exams**
7.1 Solve simple radiation propagation problems	X	X
7.2 Invert a governing equation to surface physical properties (e.g. reflectance or temperature)	X	X
7.3 Generate spectral class maps from multispectral images	X	X
7.4 Solve for a spatially sharpened image from a fused image pair	X	X

8.0 Program outcomes and/or goals supported by this course

Prepares graduate students in science and engineering for careers in the field of remote sensing

9.0

	General Education Learning Outcome Supported by the Course	Assessment Method
Communication		
	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	
Intellectual Inquiry		
	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	
Ethical, Social and Global Awareness		
	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	
Scientific, Mathematical and Technological Literacy		
	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	
Creativity, Innovation and Artistic Literacy		
	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