ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

Chester F. Carlson Center for Imaging Science

NEW COURSE: COS-IMGS-729 - Photogrammetry for Airborne and Space Systems

1.0 Course Approvals

Required course approvals:	**Approval request date:**	**Approval granted date:**
Academic Unit Curriculum Committee	9/10/2010	9/25/2010
College Curriculum Committee	9/28/2011	10/4/2011

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:	Photogrammetry for Airborne and Space Systems
Credit hours:	3
Prerequisite(s):	COS-IMGS-616
Co-requisite(s):	None
Course proposed by:	Donald L. Light
Effective date:	Fall 2013

	Contact hours	**Maximum students/section**
Classroom	3	10
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: 1051-759 Elements of Photogrammetry I
	Semester Replacement (SR) Please indicate the quarter course(s) this course is replacing:
	New:

2.2 Semester(s) offered (check)

Fall X	Spring	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: None
Students who might elect to take the course: Students in Imaging Science, Remote Sensing, Physics, Engineering, Computer Science.

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

To learn the fundamentals and mathematics of photogrammetry and its applications to mapping, environmental engineering, reconnaissance, and space systems.

4.0 Course description

IMGS-729 Photogrammetry for Airborne and Space Systems

This course will introduce the fundamentals essential to describing photogrammetry and its uses for deriving point positions, 3-D coordinates, digital elevation models, image maps, and topographic maps from airborne or spaceborne imaging systems. It will cover the geometry of film and digital cameras, calibration of cameras, image measurements, and refinements such as atmospheric refraction, distortion corrections, image measurements, and transformation of coordinates. The geometry of the single photo will be utilized to develop the general solution to the problem of photogrammetry. Derivation and use of the collinearity equations will be emphasized to demonstrate their applicability to ground-surveyed coordinates, global positioning system (GPS), and inertial management units (IMUs) for positioning and orientation of the camera images for aerial triangulation and least squares adjustments. Other selected topics are light planning for mapping projects, object space coordinate systems, map accuracy standards, and estimating errors in the system outputs. (IMGS-616) **Class 3, Credit 3 (F)**

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

5.1 Wolf, *Elements of Photogrammetry*, McGraw-Hill, New York, NY
5.2 *ASPRS Manual of Photogrammetry*, Washington, DC

6.0 Topics (outline):

6.1 Introduction and Objectives of Photogrammetry
- 6.1.1 Principles of Photography and Imaging
- 6.1.2 Cameras and Types of Imaging Devices
- 6.1.3 Calibrating Cameras
- 6.1.4 Converting Film to Digital Pixels

6.2 Image Measurements and Refinements
- 6.2.1 Object Space Coordinate Systems
- 6.2.2 Datum's for Mapping and Map Projections

6.3. Geometry of the Vertical Photograph and Images
- 6.3.1 Two Photo Geometry for Stereo and Measuring the Z-Coordinate
- 6.3.2 Geometry of Tilted Photos (Obliques)
- 6.3.3 Project Planning and Planning Flight Lines

6.3.4 Introduction to Analytical Photogrammetry
6.4 The General Problem of Photogrammetry
6.4.1 Aero Triangulation
6.4.2 Satellite Photogrammetry
6.4.3 Error Analysis of Near Vertical Photos

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

Learning Outcome	Quizzes and Examinations	Homework Assignments
7.1 Describe the fundamental properties of aerial cameras and sensors	X	X
7.2 Explain performance metrics of the frame camera, Pan camera, and strip cameras (Digital or Film)	X	X
7.3 Assess the spatial capabilities that affect the design of imaging systems	X	X
7.4 Describe the fundamental considerations for flight planning	X	X
7.5 Calculate spatial accuracy potential of airborne and space systems	X	X
7.6 Compare frame cameras versus linear arrays for mapping	X	X
7.7 Define the system and mission characteristics for an imaging project	X	X

8.0 Program outcomes and/or goals supported by this course

8.1 To demonstrate fundamental principles of image georectification.
8.2 To evaluate spatial position accuracy of remote sensing images.
8.3 Apply knowledge of the science and technology of imaging.

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.)

10.1 Computer lab. 10.2 Smart classroom.