



**ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM**

COLLEGE OF SCIENCE

Chester F. Carlson Center for Imaging Science

NEW COURSE: COS-IMGS-742 Testing of Focal Plane Arrays-X

1.0 Course Designations and Approvals

Required course approvals:	Approval request date:	Approval granted date:
Academic Unit Curriculum Committee	3-31-2011	4-1-2011
College Curriculum Committee	4-29-2011	5-3-2011

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:	Testing of Focal Plane Arrays
Credit hours:	3
Prerequisite(s):	Graduate status in Imaging Science or by permission of instructor
Co-requisite(s):	None
Course proposed by:	Zoran Ninkov
Effective date:	Fall 2013

	Contact hours	Maximum students/section
Classroom	1	15
Lab	6	15
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: 1051-728 Testing of Focal Plane Arrays
	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
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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: (by program and year, as appropriate)

First or second year graduate students following the Instrumentation concentrations in the AST program.

Students who might elect to take the course:

Advanced undergraduate and graduate students in Imaging Science. Other undergraduate and graduate students in the College of Science, Engineering and Imaging Arts & Sciences may take the class with the permission of the instructor.

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

To be able to test and evaluate camera focal plane arrays and determine industry standard metrics for their performance.

4.0 Course description (as it will appear in the RIT Catalog, including pre- and co-requisites, and quarters offered). Please use the following format:

COS-IMGS-742-X

Testing of Focal Plane Arrays

This course is an introduction to the techniques used for the testing of solid state imaging detectors such as CCDs, CMOS and Infrared Arrays. Focal plane array users in industry, government and university need to ensure that key operating parameters for such devices either fall within an operating range or that the limitation to the performance is understood. This is a hands-on course where the students will measure the performance parameters of a particular camera in detail. (Graduate status in Imaging Science or by permission of instructor) **Class 1, Lab 6, Credit 3 (S)**

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

Ohta, Jun, *Smart CMOS Image Sensors and Applications*, CRC Press, Boca Raton, FL

6.0 Topics (outline):

- 6.1 The Photon Transfer method for determining gain conversion and charge transfer efficiency in CCD systems.
- 6.2 Dark Current and Linearity in a CCD
- 6.3 Cosmic Rate effects in CCDs and the use of x-ray events to determine the charge transfer efficiency.
- 6.4 Determining the spectral quantum efficiency for a CCD
- 6.5 Measuring the Modulation transfer function of a CCD
- 6.6 Coupling of the CCD to various optical system including telescopes and microscopes.

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

Course Learning Outcome	Test and Exams	Lab Book
7.1 Measure the dark current, linearity, noise and gain of a focal plane array.	x	x
7.2 Measure the charge transfer efficiency of a CCD	x	x
7.3 Measure the spectral quantum efficiency of a focal plane array	x	x
7.4 Measure the MTF of a CCD system.	x	x

8.0 Program outcomes and/or goals supported by this course

8.1 To provide students with a depth and breadth of knowledge of detectors and related technologies.
8.2 Provide students with a depth and breadth of knowledge of astrophysics and related technologies, enabling them to develop as effective researchers and/or educators.
8.3 To develop the student's skills in applying mathematical techniques and scientific reasoning to different laboratory situations.

9.0 N/A

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

10.1 Dedicated laboratory for assembly of the cameras
10.2 Smart Classroom