ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

Center for Imaging Science

NEW COURSE (COS-IMGS-789): Special Topics: Interactive Virtual Environments

1.0 Course Designations and Approvals

Required course approvals:	**Approval request date:**	**Approval granted date:**
Academic Unit Curriculum Committee	10/13/15	10/28/15
College Curriculum Committee		

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

2.0 Course information:

Course title:	Interactive Virtual Environments
Credit hours:	3
Prerequisite(s):	Graduate standing in CIS or permission of the instructor
Co-requisite(s):	
Course proposed by:	Gabriel Diaz
Effective date:	January 2016

	Contact hours	**Maximum students/section**
Classroom	1	8
Lab	4	
Studio		
Other (specify)		

2.a 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.b Student Requirements

Students required to take this course: (by program and year, as appropriate) None. This is an elective course.
Students who might elect to take the course: Graduate students in imaging science, computer science, and psychology.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

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

This is primarily a laboratory course, where laboratory time will be used as an opportunity for supervised programming in Vizard, a Python based virtual-reality programming environment. Guided readings/lecture will touch upon concepts important to the development of real-time immersive environments. After developing familiarity with the Vizard programming environment, students will design and implement their own immersive virtual reality experiment, complete with real-time data export, and post-hoc data analysis.	

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:

IMGS-789 Interactive Virtual Environments

This course will provide hands on experience in the development of real-time immersive virtual reality environments. As a result, students will work with programmable 3D coordinate systems, real-time computer graphics, and motion capture. This is primarily a project-based course that will take place in the laboratory, with lectures only as necessary to support hands-on learning. In addition, regular readings will serve as inspiration for lab-based exploration of the human visual and motor system in simulated environments. Preliminary readings will take the perspective that one can understand goal-directed visual and motor behavior by treating the human system as a functionally specific imaging system, as is observable through systematic manipulation of the visual input, and monitoring of the motor output. Students are also welcome to choose projects and propose readings that more closely match their own interests. (Prerequisites: Graduate Standing or permission of instructor) **Class 1, Lab 4, Credit 3 (S)**

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

Vizard Virtual Reality Toolkit

6.0 Topics (outline):

1. Hardware components of an immersive virtual reality system
2. Human factors
3. Understanding system latency
4. Experimental design
5. Real-time graphics for behavioral research
   a. The frustum and camera models
   b. Hierarchical coordinate systems
   c. Callback functions and timers
   d. Experiment design
   e. Shading and illumination

f. Physics engines
g. Non-blocking functions and real-time data export
h. Data analysis and visualization in Python with PANDAS and Bokeh

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

Course Learning Outcome	Assessment Method (identify specific, key assignment)
Design a virtual reality experiment	Project
Analyze real-time performance data	Project
Group presentations	Project

8.0 Program outcomes and/or goals supported by this course

8.1 Obtained crucial knowledge and skills for implementing a real-time simulation and virtual reality system. 8.2 Acquired understanding of real-time simulation for data collection. 8.3 Understand methods of data analysis for behavioral understanding. 8.3 Learned ability to collaborate with cross-disciplinary experts. Collaboration is a general goal of the programs in imaging science.	

9.0

	General Education Learning Outcome Supported by the Course, if appropriate	**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.)

This course requires a laboratory that houses the unique virtual-reality equipment necessary (currently CAR-2101).	

***Optional course designation; approval request date:** This is the date that the college curriculum committee forwards this course to the appropriate optional course designation curriculum committee for review. The chair of the college curriculum committee is responsible to fill in this date.

****Optional course designation; approval granted date:** This is the date the optional course designation curriculum committee approves a course for the requested optional course designation. The chair of the appropriate optional course designation curriculum committee is responsible to fill in this date.