**Omnibus\* Course Syllabus**

**College of** Letters, Arts, and Sciences

**Department**: Mathematical and Computer Sciences **Instructor:** Gerald Shultz

**Prefix and Course Number**: CS 390 **Semester/year offered:** Spring 2015

**Banner Number (for Academic and Student Affairs use):**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(**Students registering after Census date** will be **ineligible for the COF stipend** and must pay the full tuition for the omnibus course. Please see COF-FAQ for details regarding registration deadlines: <http://www.mscd.edu/news/cof/cof_faq.htm>)

**Course Title**: Rigid Body Simulation for Game Programming

**Credit Hours**: 4 (4+0)

**Total Contact Hours per semester (assuming 15-16 week semester):**

Lecture 60 Lab 0 Internship 0 Practicum 0 Other (specify type and hours): 0

 **Additional Student Work Hours per course:** 120

**Meeting Times/Dates**: MW 10:00-11:50

**Grading Mode(s)**: L **Schedule Type(s):** L

**Prerequisites**: CS 3510 or CS 390A with a grade of "C" or better, or permission of instructor

Corequisites:

Banner Enforced:

Prerequisite(s): CS3510 with a grade of C or better, OR CS 390A with a grade of C or

 better

Corequisite(s):

Prerequisite(s) or Corequisite(s):

Course Description:

Simulation of rigid bodies is a core part of many computer games and other interactive technologies, and many ideas for doing this have been proposed. This course develops in detail a mathematical and algorithmic framework for a simple game engine, presenting a single focused approach to each of the problems involved in rigid body simulation.

Required Reading Materials

 Course notes provided by instructor

Evaluation of Student Performance (*format* - 1, a, i, ii, etc.):

1. written homework exercises
2. programming projects
3. tests

Specific ***Measurable*** Student Behavioral Learning Objectives (*format* - 1, a, i, ii, etc.):

Upon completion of this course the student should be able to

1. Write code to implement mathematical tools
2. Derive formulas using the mathematical tools covered and basic algebra
3. Create customized polyhedral models and integrate them into the framework
4. Demonstrate and explain the broad phase collision detection algorithm
5. Demonstrate and explain the narrow phase collision detection algorithm
6. Perform efficiency analysis of the various aspects of the framework
7. Create computer games by using and augmenting the given framework

Detailed outline of course content (major topics and subtopics) or outline of field experience/ internship (experience, responsibilities and supervision) (*format* – I, A, 1, a, etc.) – please see note[[1]](#footnote-1) below:

1. Review of mathematical tools
2. dot product
3. cross product
4. quaternions
5. Basic physics
6. ballistic motion
7. rotation
8. impulses
9. Algorithmic framework for a simple game engine
10. Modeling polyhedral bodies
11. Broad phase collision detection
12. swept volumes
13. hash table
14. Narrow phase collision detection
15. the GJK algorithm
16. algorithm for continuous collision detection
17. Applying impulses to handle single collisions
18. Iterative algorithm for handling multiple simultaneous collisions

**ADA Syllabus Statement**

The Metropolitan State University of Denver is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. If you have a disability which may impact your performance, attendance, or grades in this class and are requesting accommodations, then you must first register with the Access Center, located in the Auraria Library, Suite 116, 303-556-8387.

The Access Center is the designated department responsible for coordinating accommodations and services for students with disabilities. Accommodations will not be granted prior to my receipt of your faculty notification letter from the Access Center. Please note that accommodations are never provided retroactively {i.e., prior to the receipt of your faculty notification letter.) Once I am in receipt of your official Access Center faculty notification letter, I would be happy to meet with you to discuss your accommodations. All discussions will remain confidential. Further information is available by visiting the Access center website, [msudenver.edu/access/](http://www.msudenver.edu/access/).

***Excerpt from***

**METROPOLITAN STATE UNIVERSITY OFDENVER**

**GUIDELINES FOR THE PROTECTION OF HUMAN SUBJECTS**

*Available in full on the MSU Denver website:*

<http://www.msudenver.edu/irb/gettingstarted/studentresearch/>

\*\*\*

**This required course content MUST be part of the “Detailed outline of course content” section of the independent study course syllabus OR a statement must be attached that clearly states how the proper procedures have been followed by the course instructor and/or the student.**

**The Associate VP for Academic and Student Affairs cannot sign an independent study syllabus that appears to involve human subjects and/or personal data unless this information is provided.**

1. note: If the omnibus course includes student and/or course instructor research that involves **(1)** interviewing subjects **and/or (2)** handling personal data **and/or (3)** topics which could be viewed as “sensitive” (e.g., personal political views, health data, sexuality, etc.), **then approval by the Office of Academic and Student Affairs will require assurance that the guidelines described at the end of this document have been followed.** [↑](#footnote-ref-1)