CSCE 4215/5255 Game Math & Physics

Instructor: Ian Parberry
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Office Hours: TBA
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Semester: Fall 2017
Time: TR 1:00 -2:20pm
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Learning Outcomes
By the end of the course, you will:

1. Demonstrate knowledge of linear algebra applied to computer games and graphics.
2. Demonstrate knowledge of geometry applied to computer games and graphics.
3. Demonstrate a basic understanding of mechanics sufficient to understand and solve problems involving bodies in motion.
4. Construct discrete implementations from continuous mathematical models demonstrating knowledge of numerical methods and programming paradigms.
5. Demonstrate competency in the writing and testing of math and physics-related code for computer games.

Prerequisites
The prerequisite for this class are:

1. MATH 2700: Linear Algebra and Vector Geometry
2. CSCE 2100: Computing Foundations I
3. PHYS 1710/PHYS 1730: Mechanics

Students who have not passed the prerequisites or their equivalents will be dropped. If in doubt, notify me as soon as possible.

Course Requirements
You will be graded on a sequence of programming assignments. Group work will not be permitted. Full information will be available shortly.

Cellphone Policy
I will mock your ringtone.

Disability Accommodation
The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.
Grading Policy for CSCE 4215/5255
Game Math & Physics
Fall 2017

This grading policy is designed to maximize your opportunities for demonstrating mastery of the class material by giving you more control over your calendar, more choices, and more instructor feedback compared to traditional grading schemes.

This Class is Deadline-Free

Your grades will be based on programming exercises from the text and a Rube Goldberg Machine. There are no individual deadlines for the submission of each one, just a final deadline of 8am on Monday, December 4, 2017. However, early submissions get feedback and can revise-and-resubmit multiple times until they are no longer early. Full details are given below.

Submission Protocol

Turn in your programs by committing them to your personal Subversion repository and notifying me by email. There is only one deadline: No program will be accepted after 8am on Monday, December 4, 2017. Your submission will be graded on whether it satisfies the requirements and how professional your source code is.

If you submit a program from Chapters 4-8 before 8am on Monday October 23, 2017, or a program from Chapters 10-13 before 8am on Monday December 4, 2017, then I will respond with a list of things that you must do to make it acceptable and you will be allowed to revise and resubmit. Otherwise, I will give a binary response of acceptable/unacceptable and you will not be allowed to resubmit. Similarly, your Rube Goldberg Machine must be submitted before 8am Monday November 27 for a revise-and-resubmit.

Resubmissions will be graded on the same criteria as the original submission. You get just one initial submission but as many revise-and-resubmits as necessary until the cut-off dates in the previous paragraph. I will accept at most one program from each chapter per student. You may submit as many as you wish until time runs out.

You must attend class on Thursday, December 7 to show your Rube Goldberg Machine to everybody. Failure to do so will result in the loss of one letter grade.

Minimum Grade Requirements

Students enrolled in CSCE 5255 (Graduate):

A. Three Mage Level exercises, one Paladin Level exercise or higher, and a Rube Goldberg Machine at Master Level.
B. Two Mage Level exercises, two Paladin Level exercises or higher, and a Rube Goldberg Machine at Journeyman Level or higher.
C. One Mage level exercise, three Paladin Level exercises, and a Rube Goldberg Machine at Apprentice Level or higher.
D. Four exercises at any level and a Rube Goldberg Machine that isn’t totally lame.

Students enrolled in CSCE 4215 (Undergraduate):

A. Four Paladin Level exercises and a Rube Goldberg Machine at Master Level.
B. Four Paladin Level exercises and a Rube Goldberg Machine at Journeyman Level or higher.
C. Four Paladin Level exercises and a Rube Goldberg Machine at Apprentice Level or higher.
D. Three Paladin Level exercises and a Rube Goldberg Machine that isn’t totally lame.

Programming Tasks

Your programming tasks are chosen from the exercises at the end of each chapter of the text for this course, *Introduction to Game Physics with Box2D* (Second Edition). A pdf of the draft is currently available on Blackboard. There are two levels, *Mage* and *Paladin*.

**Mage Level (CSCE 5255)**

- Chapter 4 Programming Exercises 3, 4
- Chapter 6 Exercises 7 (the second one), 8, 9
- Chapter 10 Exercises 2, 3
- Chapter 11 Exercises 6, 7
- Chapter 12 Exercises 6, 7
- Chapter 13 Exercises 1, 2, 3, 5

**Paladin Level (CSCE 4215)**

- Chapter 4 Programming Exercises 1, 2
- Chapter 6 Exercises 4, 7 (the first one)
- Chapter 8 Exercises 1, 2, 3
- Chapter 11 Exercises 3, 5
- Chapter 12 Exercises 1, 2
- Chapter 13 Exercise 4

**Rube Goldberg Machines**

The artist Reuben Garrett Lucius Goldberg (1883-1970) is renowned for drawing over 50,000 cartoons depicting complicated machines that perform simple tasks in ridiculous and amusing ways, giving rise to the popular term *Rube Goldberg machine*. An example of his work is shown below. Your task is to program a Rube Goldberg machine using Box2D.

Rube Goldberg machines typically consist of a cascading sequence of discrete stages, each of which consists of one or more devices that have a common theme or principle. Examples include a ball rolling down a ramp (lame, but useful for transitioning between stages), a row of toppling dominoes, a bucket that fills with balls attached to a pulley system, etc. Have fun coming up with your own ideas.
Your Rube Goldberg Machine must be derived from the Rube Goldberg Blank in the code base. The space bar must start the machine and, where required, the Back key must reset it to the initial conditions after it has finished. All Rube Goldberg Machines must end by pressing the red button and playing the sound in the Rube Goldberg Blank. There must be a reasonable attempt at playing sounds for all actions. You may use code from the code base provided you modify it in a nontrivial way beyond just copy-and-paste. Here are the minimum requirements for Apprentice, Journeyman, and Master level Rube Goldberg machines.

**Apprentice**
Runs for at least 15 seconds and consists of at least three different stages.

**Journeyman**
Runs for at least 30 seconds, is resettable, and consists of at least six different stages at least two of which are not from the code base.

**Master**
Runs for at least 45 seconds, is resettable, and consists of at least eight different stages at least five of which are not from the code base.