CSCE 4215
Programming Math & Physics for Games
Syllabus 2014

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General Information

• My name is Ian Parberry. If you wish to be formal, please call me Dr. Parberry.
• Contact: http://larc.unt.edu/ian/

Catalog Description

Fundamentals of game math and physics for game development, including linear algebra, matrix math for graphics, quaternions, basic physics equations, game math and physics implementation, physics engines.

Prerequisites

The listed prerequisites for this class are:
1. MATH 2700: Linear Algebra and Vector Geometry
2. CSCE 2100: Computing Foundations I
3. PHYS 1710/PHYS 1730: Mechanics

Learning Outcomes

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.

Course Philosophy

The professional game programmer:
✔ Needs a working knowledge of game math and physics.
✔ Does not need rote memorization of math formalism.
✔ Needs an intuitive understanding of what all the math means, and how it is implemented in code.
✔ Does not need to write their own physics engine.
✔ Needs to be understand from personal experience how physics engines work, where their pitfalls lie, and how they are used.
Examinations

Midterm
• In class, Tuesday, October 14, 2014.
• Review session: in class Thursday, October 9.
• A sample midterm exam will be available.

Final
• Thursday, December 11, 2014, 11am-1pm.
• Review session: in class Thursday, December 4.
• A sample final exam will be available.

Examinations

• Examinations will have 5 questions, each of which covers a single area in multiple parts.
• Examinations are Open Book, which means that you may consult any hardcopy or online documents.
• The following items are, however, banned:
  1. Communication with another human being by any means including but not limited to text message, email, and social media;
  2. The use of any program to compute answers, including but not limited to programs you have written yourself, programs you have downloaded in advance, and programs that are available online.

Homeworks and Programs

• 5-6 written homeworks.
• 3-4 programming assignments.
• Programming assignments will require either:
  • Windows 8.1, Visual Studio 2013, and DirectX 11.2.
  • Windows 7, Visual Studio 2010, and the DirectX 9 SDK (June 2010).
• You will be working with game physics both hand-coded from scratch, and with the Box2D physics engine.

Percentage of Final Grade

<table>
<thead>
<tr>
<th>What</th>
<th>%</th>
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<tbody>
<tr>
<td>Homeworks</td>
<td>10%</td>
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<tr>
<td>Programs</td>
<td>30%</td>
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<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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The Game Lab

• NTRP F204
• Open 40 hours per week (ish)
• Lab hours will be posted
• 22 Intel Core i7-3930K CPU @ 3.2GHz with 32GB of RAM (hex-core, hyperthreaded)
• Dual monitors, DirectX 11.2 capable video cards
• 64-bit Windows 8.1
• Visual Studio 2013
Class Policies

- Attendance is not mandatory, but you’re a fool if you miss too many classes for no good reason.
- Please put your cellphones on “stun”, but it’s not the end of the world if you forget.
- Failure to turn in more than one program will result in an automatic F.
- Failure to turn in the midterm or final examination will result in an automatic F.
- No makeup work unless you have a documented, verifiable emergency and I am notified as soon as the situation allows.
- No group work allowed.

Class Calendar

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Tuesday 8/26</td>
<td>Course Intro</td>
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<tr>
<td>Thursday 8/28</td>
<td>Basic Math</td>
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<tr>
<td>Tuesday 9/2</td>
<td>Digital Calculus</td>
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<tr>
<td>Thursday 9/4</td>
<td>Collision Detection and Response</td>
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<tr>
<td>Tuesday 9/9</td>
<td>Programming Rigid Body Physics</td>
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<tr>
<td>Thursday 9/11</td>
<td>Programming Rigid Body Physics</td>
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<tr>
<td>Tuesday 9/16</td>
<td>Programming Soft Body Physics</td>
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<tr>
<td>Thursday 9/18</td>
<td>Programming Soft Body Physics</td>
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<tr>
<td>Tuesday 9/21</td>
<td>Box2D Fundamentals</td>
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<tr>
<td>Thursday 9/27</td>
<td>Box2D Fundamentals</td>
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<tr>
<td>Tuesday 9/30</td>
<td>Programming with Box2D</td>
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<tr>
<td>Thursday 10/2</td>
<td>Advanced Box2D</td>
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<tr>
<td>Tuesday 10/7</td>
<td>Intro to Bullet Physics</td>
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<tr>
<td>Thursday 10/9</td>
<td>Review</td>
</tr>
<tr>
<td>Tuesday 10/14</td>
<td>Midterm Exam</td>
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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.

Cheating Policy

- The Department of Computer Science & Engineering cheating policy will be adhered to.
- Any student caught cheating will receive a grade of F for this course, and further disciplinary action will be taken.
**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**CHEATING POLICY**

Cheating:
- Turning in someone else's work as your own. This includes, but is not limited to, another classmate, another textbook, a student in another class, or a student in a prior semester.
- Allowing someone to turn in your work as their own.
- Several people writing one program and turning in multiple copies, all represented (implicitly or explicitly) as individual work.
- Stealing an examination or solution.
- Using unauthorized material during a test or quiz.
- Changing a test, program, or other student work after the work has been graded and requesting that the work be regraded.

**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**CHEATING POLICY**

Not Cheating:
- Turning in work alone or with the help of the course's staff.
- Submission of one assignment for a group of students if group work is explicitly permitted (or required).
- Getting or giving help on any university or department operating system.
- High-level discussion of course material for better understanding. Discussion of assignments for clarification.

**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**CHEATING POLICY**

- When cheating is deemed to have occurred, appropriate disciplinary action will be taken.
- A notice will be placed in the student's permanent computer science record outlining the behavior and the subsequent disciplinary action.
- The instructor will impose a penalty of failure in the course and may deny the student permission to drop the course.
- It is also possible that the student may be barred from subsequent registration in any computer science and engineering courses at the University of North Texas.
- The matter will be referred to the appropriate dean for further university action.

**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**CHEATING POLICY**

- The student is directed to the University of North Texas Student Handbook for general university regulations on cheating under the section on categories of misconduct.
- All procedures concerning cheating are subject to the student's right to due process as outlined in the Student Handbook.

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**Summary**

- This is a class on programming math and physics in games.
- The emphasis is on the understanding and implementation of math and physics in games.
- There are homeworks, programming assignments, a midterm, and a final.
- The examinations will be open book, but you may not use outside assistance.
- Don’t cheat.