Physics 1200—Physics for Video Games
Spring, 2013
High Point University

Syllabus

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http://physics.highpoint.edu/∼atitus/

My personal mission is to encourage you to be a life-long, interdisciplinary learner. If you are teachable, motivated, and diligent, you will be successful.

My educational philosophy is that you learn best when you are actively engaged with the subject through activities such as reading (and answering questions about what you read), discussing, experimenting, and solving problems. Lectures are useful for motivation and synthesis, but for most students merely listening to lectures and copying lecture notes is an ineffective method to learn. It's when you study individually, think deeply about the subject, ask questions, develop ideas and test them, and subsequently dialogue with classmates and the professor that you learn the most. My role as the professor is to create an environment that promotes active-learning, to assess your learning, and to provide guidance and mentorship along the way.

I expect you to learn the tools of scientific exploration that we will use in this class, including computational modeling, curve-fitting, video analysis, and laboratory sensors and technology.

I reserve the privilege to change this syllabus based on feedback from you and what I determine is best for the course. If the syllabus is updated, you will receive an electronic copy of the updated version.

Lecture and Lab: TTh 1:20PM - 03:00PM, 102 Congdon Hall. The lab and lecture are integrated. This is a lab-based physics course. Experiments are fundamental to the course. You will take what you learn in an experiment, and you will apply it in game design. A list of experiments is given in Table 2.

Office Hours: Please see the schedule posted on my office door at 361 Congdon.

Course Description: An introduction to the laws of physics needed to produce games, simulations, and computer animations with compelling realism. Topics include kinematics, Newtons laws of motion, conservation of momentum, conservation of energy, and rotational dynamics, with applications to projectile motion, collisions, oscillations, and rotational motion. Laboratory topics include measurement, graphical interpretation and curve fits, video analysis, and simulation development. No programming experience is required. This course is intended for non-science majors and satisfies the Area II General Education requirement. Four credits (2 lecture hours + 2 lab hours). Offered Spring.

Textbook(s): We will use handouts and class notes as our text.

Course Web Site: http://physics.highpoint.edu/∼atitus/courses/phy1200/
All course materials and announcements will be posted on the course web site. In the event that we cannot meet, you will be expected to get instructions and activities from the course web site.

Grading Scale (min% weighted average): A+ (97), A (93), A− (90), B+ (87), B (83), B− (80), C+ (77), C (73), C− (70), D+ (67), D 63, D− (60), F (<60). I reserve the right to decrease the minimum scores if it is appropriate.

Grade Determination: labs, programs, and homework (30%), quizzes (40%; 2 quizzes, 20% each), final project (30%). All programming projects will have benchmarks for earning an A, B, or C on the assignment.

In-class activities and labs: Research shows that active-learning is more effective than passive listening to lectures. As a result, we will do numerous in-class activities and laboratory experiments. These will be collected and graded. This work cannot be made-up under any circumstances.

Homework: Homework, lab reports, and programs will be collected with WebAssign. To create an account, go to http://www.webassign.net/

Quizzes: There will be two quizzes. Any missed quiz will count as a zero. If a quiz is missed due to a school activity or a medical condition that requires surgery or hospitalization, then the final exam grade will substitute for the (missed) quiz grade. Absences due to a school activity must be approved by the professor prior to the quiz. Quizzes will consist of two sections: (1) exercises and (2) critical thinking.

Final Exam: Mon, 4/29/13, 12:00 PM–3:00 PM. *You will present your final project during the final exam time.*

Help: We have a SI for the course. He will be available for tutoring and for help writing your programs. His schedule will be posted on our course web site.

Academic Services Center has both individual and group tutoring available for HPU students. Individual tutoring is for those students who need one-on-one assistance with a course and is appointment based. To make an appointment contact Craig Curty, Director of Academic Services Center, by phone (336) 841-9014 or via e-mail ccurty@highpoint.edu. Group tutoring is available for specific courses certain days and times during the week and no appointment is necessary. All tutoring takes place in the lower level of Smith Library. For further information regarding tutoring and updated tutor walk-in schedules, please check the website http://www.highpoint.edu/academics/asc.

Expectations: Expect to work hard, to be challenged, to learn, and to work together. Expect to break through any struggles, doubts, and challenges to gain new abilities, accomplish new tasks, and develop analytical reasoning skills.

Accommodations: Students who require classroom accommodations due to a diagnosed disability must submit the appropriate documentation to Disability Support in the Office of Academic Development, 4th Floor Smith Library. Students' needs for accommodations must be made at the beginning of a course. Accommodations are not retroactive.

Attendance: If you have more than two absences, you can be placed on class attendance probation and can be withdrawn from the class upon further absences. I reserve the right to choose whether to withdraw you or not for lack of attendance.

Technology: The software and programs that we use and develop will be cross-platform and will be open-source. We have Windows computers in the classroom. You are welcome to bring your own laptop to class and use it as long as you have installed the appropriate software before coming to class. I will give provide links to software on our course web site.

Schedule: A tentative schedule of daily topics and activities is given in Table 3. This will likely change throughout the semester. An up-to-date schedule will be posted on our course web site.

Table 1: Experiments

Experiment No.	**Experiment**
1	Measuring coordinates of an object
2	Uniform motion of a ball on a level, low-friction track
3	1-D Elastic collision of a ball with a rigid barrier
4	2-D Inelastic collision of a ball with a rigid barrier
5	Constant acceleration of a fancart
6	Newton's second law
7	Projectile motion
8	Physics of Angry Birds
10	Center of mass and conservation of momentum

Table 2: Games you will develop and extend

Game
Space Invaders
Pong
Lunar Lander
Tank Wars
Putt-Putt
Asteroids

Table 3: Tentative Schedule of Activities

Day No.	**Date**	**Topic**
1	1/8	introduction to the course
2	1/10	CH1-2 coordinates
3	1/15	CH3 Intro to VPython
4	1/17	CH4 Vectors
5	1/22	CH5 Uniform motion
6	1/24	CH6 Uniform motion lab
7	1/29	CH7 Uniform motion program
8	1/31	Quiz 1: uniform motion
9	2/5	CH8 Lists, Loops, and Ifs
10	2/7	CH9 Keyboard interactions
11	2/12	CH10 Collision detection
12	2/14	CH11 Galilean relatvity
13	2/19	CH12 Collision with a stationary rigid barrier
14	2/21	CH13 Lab: Coefficient of restitution
15	2/26	CH14 Pong
16	2/28	CH15 Lab: Fan cart
17	3/12	CH16 Newton's second law
18	3/14	CH17 Fan cart program
19	3/19	CH18 Lunar lander
20	3/21	Quiz 2: constant force motion
21	3/26	CH19 Projectile motion
22	3/28	CH20 Angry birds
23	4/2	CH21 Tank wars
24	4/4	CH22 Friction (and Putt-Putt)
25	4/9	CH23 Lab: Center of mass and conservation of momentum
26	4/11	CH24 Asteroids
27	4/16	Final Project
28	4/18	Final Project
29	4/23	Final Exam