PHYS 1210: Engineering/College Physics I
SPRING 2012 - Section 03

Instructor:	**Jinke Tang**		Office:	PS 216
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Co-Instructor:	**Gaurab Rimal**,	PS 109		grimal@uwyo.edu
Lab Coordinator:	Travis Laurance	PS 106		travis@uwyo.edu

Class Time:	MWF 12:10 – 1:50 pm	Class Location:	PS 133

Office hours:	M,T,W,R,F, 10-11 am, or by appointment
Class Web Page:	http://physics.uwyo.edu/~jinke/syllabusSpring2012121003.pdf
USP Credit:	This class satisfies the SP requirement of the University Studies Program
Prerequisites:	MATH 2200

Required Materials
Text: Sears & Zemansky's *University Physics*, UW edition (or 12th ed., Note: CHAPTER NUMBERS 12,13,14 HAVE CHANGED in the UW ed.) by Young & Freedman (Volume 1, Mechanics Chapters 1 – 16)

Mastering Physics for homework: Log on to: www.masteringphysics.com
Go to University of Wyoming and class **JTPHYS1210S2012**

Physics 1210/1310 Laboratory Manual: *Calculus Based University Physics I* by Rudi Michalak, available at university bookstore

Poll Everywhere for interactive in-class activities and attendance: We will use cell phones or laptops for Q/A and other in-class interactions/practices. You need to register at http://www.polleverywhere.com. Under settings add your phone number, and then certify it to the United States (not US Educator). In order to make your name visible to the instructor, go to Voter Registration on the left side under settings, register as a voter (at the bottom), and then put in the instructor's email address (see detailed instruction below).

Supplementary Reading Suggestions:
The Feynman Lectures on Physics, and
Physics for Scientists and Engineers with Modern Physics by Serway

Course Content
Welcome to our introductory physics for engineers & scientists! This course is an introduction to the fundamental physical phenomena and physics laws that shape our universe. Topics you will learn about include linear and rotational motion, Newton's Laws, work, energy, gravity, oscillations, waves, and fluids. You will gain physical intuition and problem solving ability which will allow you to explain and predict what goes on in the physical world. Physics I is the foundation which underlies disciplines as diverse as astronomy, biology, chemistry, electronics, engineering, geology, medicine, and meteorology.

Class Meetings
This course will be taught in the style known as "workshop physics" or "studio physics", whereby lecture, lab, and discussion are all folded together. Since ideas and definitions from the text will be used freely in class, it is necessary for you to read and study the assigned chapters before class. I will avoid presenting the exact examples in your text. Instead, class meetings are for addressing the difficult points in the text as well as for helping to place the readings "in the big picture." The more actively engaged you are in class, the better you will learn and perform. Hence, there will be frequent conceptual questions posed in class—questions that you will be expected to discuss with your neighbors.

Reading Assignments
You are required to read each chapter before and after it is discussed in class.

Grading: (Subject to revision):
Tests: (2 @ 20% each)
Final Exam: (20%)

Homeworks: (20%)
Labs: (20%)

Scale:
A: (>90%)
B: (80-90%)
C: (70-80%)
D: (60-70%)
F: (<60%)

Extra Credit: Up to 5% of the course total at the instructor's discretion. I will base this on attendance and participation in class, in discussion, and the numbers of homeworks and experiments completed. To earn the full 5% extra credit, attendance needs to be nearly perfect and you must complete every homework and lab.

Labs
Labs will consist of a **prelab assignment** to be completed before you come to class on Friday (may vary), the **lab report** itself done during lab activities, and a **postlab assignment** which must be turned in by Monday of the following week. Points will automatically be deducted from late work. Thus, it is better to do work late rather than not at all, but it will be difficult to do well in this course if you are consistently late.

Tests/Exam
Homeworks will contain mostly quantitative problems, whereas lectures will provide you with largely conceptual, multiple-choice questions to tackle in class. Hence, the tests and exam will contain both quantitative and conceptual problems. They will be closed book and closed notes. You may use a calculator. I will provide you a "cheat sheet" with useful formulas and constants. **No make-up tests/exams will be given** under normal circumstances**.**

Partial credit: Partial credit will be given to solutions of the problems that are partially complete, have minimal algebra mistakes, wrong sign, or units. The steps in the solution must be presented, and no grade will be given to a problem showing a solution (such as a number) without showing the intermediate steps to get there.

All tests and exams are required and none of the scores will be dropped or replaced. The tests/exam will be held at the following times:

Test 1 - Thursday, Feb. 23 -- 5-7 pm.
Test 2 - Thursday, Apr. 5 -- 5-7 pm.
Final exam (for Section 03): Wednesday, May 2, 10:15am - 12:15pm

Homework
We use the *Mastering Physics* online homework system. Students may work in groups to do the homework. The online homework must be submitted by each student individually.
No homework grade will be dropped.
The deadline for each homework assignment is typically one week after it is assigned. Be advised not to wait till the last minute for the online submissions. It is your responsibility to submit your homework before the deadline.

MasteringPhysics.com advice and information:

- The procedures for self-registration are explained at www.masteringphysics.com (this is also the login site). Your access code is inside the student access kit that comes with the text (you will have to purchase one if you do not have the kit). The course ID is **JTPHYS1210S2012**. You may choose your login and password.
- Never use the browser's "back" button. Use the links provided.
- You will be able to submit each answer up to 20 times. Please hit "submit" after answering each question. Selecting "submit problem" will result in the problem being graded. Thus, selecting "submit problem" voids the option of additional attempts.
- Some problems have multiple components, so be sure to answer each portion.

- Many problems have hints to help you along the way. You will not be penalized for looking at the hints, and sometimes bonus credit (2%) will be awarded if you answer correctly without peeking at the hints. Either way, you win. Note that this possible bonus credit will be an extremely tiny fraction of your overall course grade, so please don't agonize over the choice.
- Some of the parameters in a given problem may be randomized. Do not assume that your friend's question has the exact same numbers as yours!
- There is a 2% tolerance for numerical answers; e.g., you can be off by, say, 1.8% and still receive full credit.
- Additional help for MasteringPhysics can be obtained through a document provided by the publishers. You can also access this at the course website.

Entering formulae in Mastering Physics: Sometimes Mastering Physics will ask you to enter algebraic formulae as your answers. Here is a chart on how to convert common formula into Mastering Physics symbolic language. Also, be sure to do homework #0 where you also get to practice this.

Formula	***Mastering Physics Coding***
$1/2\ a_x t^2$	1/2 a_x t^2 or 1/2 * a_x * t^2
$\mu_s / (F_1+F_2)^2$	mu_s / (F_1+F_2)^2
square root of $(a^2 + b^2)$	sqrt(a^2 + b^2)
$v_0^2+a\Delta t$	v_0^2 + a Delta t
$3x10^8$	3 * 10^8

Register your cell phone number at http://www.polleverywhere.com

We will use cell phones or laptops for Q/A and other in-class interactions/practices. Register your cell phone or laptop. We will interactively discuss conceptual topics, and you will be able to vote on the answers to questions using your cell phones (or laptops). To register:

1. Go to http://www.polleverywhere.com
2. Create an account
3. De-select "I am an educator"
4. Select "United States" (not "United States - Education")
5. Once your account has been created, register your cell phone number (ignore this if you will use a laptop).
6. Go under "Settings" to add the number (with your area code). Follow instructions to certify your cell number.
7. Please allow me to see your name: Under "Settings" choose "Voter Registration". Select "Register as a voter". On the next page you should enter "jtang2@uwyo.edu".
8. Bring your cell phone or laptop to each class.
9. Standard text messaging rates may apply.

Disability Statement

If you have a physical, learning, or psychological disability and require accommodations, please let me know as soon as possible. Contact University Disability Support Services in SEO, room 330 Knight Hall.

Academic honesty

Academic dishonesty is defined in University Regulation 802, Revision 2 as “an act attempted or performed which misrepresents one’s involvement in an academic task in any way, or permits another student to misrepresent the latter’s involvement in an academic task by assisting the misrepresentation.” And there are rules and procedures to handle

such cases, and serious penalties will be imposed. Note that a student who copies and a student who let's another student copy are both covered by the university rules.

General expectations

• Attend and participate in all lecture/laboratory/discussion sessions.

• Live up to your responsibility to understand the material presented.

• Take notes during lectures as appropriate.

• Complete reading/lab assignments and homework.

• Be ready for exams.

• Spend at least 10 – 15 hours per week on this course. This estimate includes labs, discussion sessions, lectures, and homework.

• Work in compliance with the university's code of academic honesty.

• Ask questions. There are no stupid questions.

• Have fun.

Class Schedule - Your Roadmap to Learning Mechanics

Week	M	W	F	Labs	Notes
Jan 9 -Jan 13	Intro 1:7-9	1:10, 2:1-2	2:3-4	Error analysis	
Jan 16-Jan 20	No Class	2:5-6	3:1-2	Lab 0	
Jan 23-Jan27	3:3-4	3:4-5	4:1-2	Lab 1	
Jan 30 – Feb 3	4:3-4	4:5-6	5:1-2	Lab 2	
Feb 6 - Feb 10	5:2-3	5:3-4	6:1	Lab 3	
Feb 13 – Feb 17	6:2-3	6:3-4	7:1		
Feb 20 – Feb 24	7:2-3	7:4-5	8:1-2	Lab 4	Test 1on Thursday, Feb. 23, 5-7 pm.
Feb 27 – Mar 2	8:3-4	8:5-6	9:1-2	Lab 5	
Mar 5 – Mar 9	9:3-4	9:5-6	10:1-2	Lab 6,7	
Mar 12 – Mar 16	-	-	-		Spring Break
Mar 19 – Mar 23	10:3-4	10:5-6	12:1-2	Lab 8	
Mar 26 – Mar 30	12:3-4	12:5-6	13:1-3		
Apr 2 – Apr 6	13:4-6	13:7-8	-		Test 2 on Thursday, Apr. 5, 5-7 pm. No class on Friday
Apr 9 – Apr 13	14:1-2	14:3-4	14:5-6	Lab 9	
Apr 16 – Apr 20	15:1-3	15:4-5	15:6-8	Lab 10	
Apr 23 – Apr 27	16:1-2	16:3-5	16:6-8	Lab 11	
Apr 30-May 4		Final Exam			Final Exam on Wednesday, May 2 10:15am - 12:15pm

Using a Problem-Solving Strategy

(Adapted from Reif 1995; Heller & Heller 1995; Winfrey 2003; Young & Freedman text)

1. Identify the Problem

A. Draw a sketch or sketches of the situation
B. Label the known and unknown quantities associated with the problem.
C. State the problem to be solved, indicating the final target quantity you seek.
D. Describe a general approach to the problem. Include fundamental physics principles.

2. Set up the Physics

A. Draw diagrams of the system including a coordinate axis and positions for all objects at any initial and final times.
B. Draw diagrams of individual components with labels for all variables and forces.
C. Identify target variables
D. Identify all the equations that are relevant to the problem.

3. Solve the Problem

A. Find an equation with your target unknown variable
B. Count the number of unknown variables, including your target variable
C. Count the number of equations containing unknown variables. Hopefully you have as many equations as unknown variables. If not, return to Step 2.
D. Solve the system of equations SYMBOLICALLY for the target variable.

4. Evaluate your Result

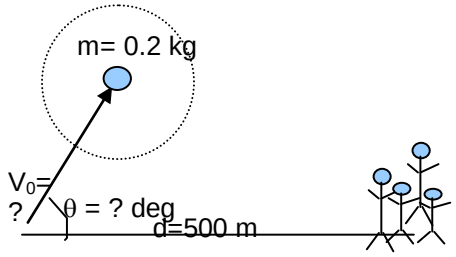
A. Use dimensional analysis to check the units of your solution equation.
B. Insert numerical values into your equation and evaluate a solution.
C. Check that the answer contains both a numerical value and correct units (e.g., m/s)
D. Evaluate whether your answer is reasonable (not too small or large?)

Example problem: The Smith family is at the fireworks and chooses to sit 500 meters away from the launch site. A firework with 9 s fuses are launched directly at the Smiths at an elevation angle of θ degrees from the horizon with an initial velocity of V meters per second. The mass of an individual firework is 0.2 kg. For what combination of launch angles and velocities are the Smiths in danger of a direct hit? (Consider the firework to be in ballistic trajectory and neglect force of air resistance)

Example Solution:

1. Identify the Problem (e.g., 2 of 10 points)

Picture of problem



Given information: d=500 m m=0.2 kg

V_0 = ? m/s

time until explosion = 9 s

launch angle = ? degrees

Problem to be solved: What initial velocity and angle puts firework at the Smiths after 9 s.

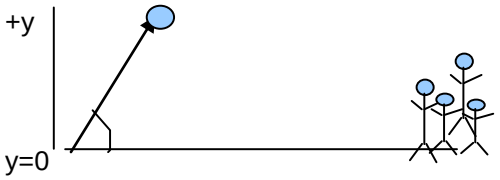
Approach: use ballistic trajectories acting under gravity to find path of firework as a function of time and see where it lands after 9 s.

2. Set up the Physics (e.g., 3 of 10 points)

Diagram axes and define variables

+x
x=0

t_0=0 s t_f=9 s
x_0=0 m x_f=? m
v_{0x}=40 cos(θ) m/s $v_{fx}=v_{0x}$
a_{0x}=0 a_{fx}=0



+y
y=0

t_0=0 s t_f=9 s
y_0=0 m y_f=? m
$v_{0y}=v_0 \sin(\theta)$ m/s $v_{fy}=v_{0y}$
a_{0y}=-9.8 m/s^2 $a_{fy}=a_{0y}$

firework free-body diagram

F_g

Target variables: x_f and y_f

Relevant Equations: $x_f=x_0 + v_0 \Delta t + 1/2\ at^2$

3. Solve the Problem (e.g., 3 of 10 points)

Construct specific equations: two equations with two unknowns: θ and v_0

$\Delta t = t_f - t_0$

1) $x_f=x_0 + v_{0x} \Delta t + 1/2\ a_x \Delta t^2$ or $x_f=x_0 + v_0 \cos\theta\ \Delta t + 1/2\ a_x \Delta t^2$

2) $y_f=y_0 + v_{0y} \Delta t + 1/2\ a_y \Delta t^2$ $y_f=y_0 + v_0 \sin\theta\ \Delta t + 1/2\ a_y \Delta t^2$

Outline the Solution

solve 1) for θ and put into 2). Then solve for v_0, then put v_0 and solve either equation for θ

Solve for target variables

$\theta = \arccos[(x_f - x_0) /(v_0\ \Delta t)]$ (solve for θ; simplify allowing that acceleration in x direction =0)

$y_f=y_0 + v_0 \sin(\arccos[(x_f - x_0) /(v_0\ \Delta t)]) \Delta t + 1/2\ a_y \Delta t^2$ (plug in to equation 2)

$=y_0 + v_0 (1-\cos(\arccos[(x_f - x_0) /(v_0 \Delta t)])) \Delta t + 1/2\ a_y \Delta t^2$

$=y_0 + v_0\ \Delta t\ -(x_f - x_0)\ + 1/2\ a_y \Delta t^2$ (simplify and solve for v_0)

$v_0 = [(y_f - y_0) + (x_f - x_0) - 1/2\ a_y \Delta t^2\ ]/\Delta t$

4. Evaluate your Solution (e.g., 2 of 10 points)

Units of solution correct?: yes! units are in distance/time (i.e., m/s)

Insert numerical values: $v_0 = [(y_f - y_0) + (x_f - x_0) - 1/2\ a_y \Delta t^2\ ]/\Delta t = [(0)+500-1/2(-9.8)9^2]/9 = 99.6$ m/s

$\theta = \arccos[(x_f - x_0) /(v_0\ \Delta t)] = \arccos [500/(99.6* 9)] = 56$ degrees

Answer reasonable? yes! Correct units? yes! m/s for velocity and degrees for angle

Lab Safety

General lab conduct

The general rules of conduct for laboratory work as displayed on the laboratories news boards apply. It is good practice to learn from the beginning a lab conduct, which does not encourage dangerous habits:

Use safety equipment where advised.
Clean up trash before you leave.
Switch appliances to "off" or "standby".
Do not leave an experiment behind in an unknown or unsafe state, e.g., hot plates must be switched off and hot water must be emptied into the sinks.

The most important rule for laboratory safety is: ***Be prepared*** and do not behave in a careless manner. Put equipment back in the place where you originally found it and take special care to not leave behind any unidentifiable substances or spills -- unknown substances present a safety concern for anyone who has to use the workspace after you. Notify your TA about broken equipment!

General safety equipment

First Aid Kit	Room 130A at door
Emergency eye flush	Room 130A at door
Fire Extinguishers	at least one per lab, near exits

There are no special regulations regarding electrical or chemical exposure. You are advised to be cautious of electrical lines and other electrical equipment and chemicals, which might be misplaced in the room. Otherwise, the electricity which is used is comparable to that of normal household exposure. That said, most deadly accidents happen at home! As for the experimental setup, in particular, watch out for broken glass, swinging objects, and power lines.

Students with special needs have to inform the course instructor at the beginning of term or as soon as possible after a special need has arisen. Special needs are (but are not limited to) battery driven implants, medication which affects performance, illness, and pregnancy. As a result, we may clear you for lab only under enhanced safety supervision or may exempt you from certain labs.

Procedure: In case of emergency or accidents

Accident:
1. Inform your TA immediately.
2. If necessary, go directly to the student health center for emergency treatment. If in doubt about the severity of your injury, the TA shall assign a person to accompany you.
3. Inform me about what has happened as soon as possible.

Emergency:
a) Follow the emergency exit instructions right away (see lab blackboard) in case of alarm. Gather outside. The TA will sign you out so that there will be no doubt whether you have left the building.
b) Campus safety: UW-alert (terror or shooter incident): Follow the procedure of Wyo-alert immediately.
http://www.uwyo.edu/cowboyparentssupport/docs/WyomingFamily11-07.pdf

Emergency contacts:
The Student Health Service (SHS) is located in the Student Health/Nursing Building, the second building east of Old Main on the south side of Prexy's Pasture. **http://uwadmnweb.uwyo.edu/ShSer/**

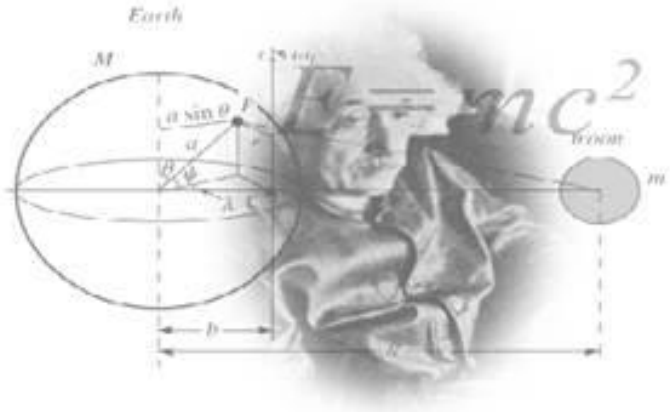
Ivinson Memorial Hospital 742-2142 ext. 2222,
Campus Police Department 766-5179,
After Hours Nurse Advice Line 766-2130

Travis Laurance	PS 106	travis@uwyo.edu
Jinke Tang	PS216	jtang2@uwyo.edu

Physics at Night: Every Monday, Tuesday, and Wednesday from 7:00 pm to 9:00 pm, a TA will be available in PS 239 (new venue) to answer questions you may have.

Struggling With Your Physics Homework?

Having Difficulty Understanding
Some Concepts?



Join us at:

Physics At Night

Every Monday, Tuesday, and Wednesday
Night
7:00 p.m.-9:00p.m.
Room 234, Physical Sciences Building