PHYS 1210/1310: Engineering/College Physics I
SYLLABUS- SPRING 2019 Section 02

Time:	M-W-F 11:00 – 12:40	Location:	STEM195
Instructor:	David Kasper (Mr. K, David)	Office:	122 Physical Sciences
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Office hours: Tuesday 11:00 – 12:00, 2:00 – 3:30 & Thursday 2:30 – 5:00, or by appointment
Class Web Page: https://uwyo.instructure.com/courses/517943
Assistant Educators: TA Riley Jordan (rjorda10@uwyo.edu)
Office hours: PS 111, Tuesday 1:30 – 2:30, Thur 9:50 – 10:50
learning assistants: Alex Schultz, Aylin McGough, Aman Kar

NOTE ON COMMUNICATIONS: I will use your UWYO email address to communicate. If you don't check this email, please forward it to your phone or an email account that you do check!

Course Content
Welcome to our introductory physics for engineers & scientists! This course is an introduction to the fundamental physics that shape our universe, including mechanics, gravity, and heat. You will gain physical intuition and problem-solving ability which will allow you to explain and predict what goes on in our world! Physics I is the foundation which underlies disciplines as diverse as astronomy, biology, chemistry, engineering, geology, medicine, and meteorology.

Since ideas and definitions from the text will be used frequently and accurately 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 often-difficult conclusions of 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, you will spend much of your class time on typical days grappling with problems in small peer groups.

If you do not have experience with this classroom environment or this is your first semester of collegiate learning (in the US or at all), please email or talk with me so that we can improve your experience.

Classroom Behavior Expectations: Participate eagerly in daily problem solving and classroom discussion with your peers at your table group. Act professionally, arrive on time, pay attention, complete your work in a timely and professional manner, and treat all deadlines seriously. Be respectful towards you classmates and instructor. Spirited debate and disagreement are to be expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from the classroom, study sessions, electronic forums, and other areas where disruptive behavior occurs."

Classroom Statement on Diversity: I, and the University of Wyoming, value an educational environment that is diverse, equitable, and inclusive. The diversity that you all bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic background, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and I consider your total identities a requisite resource for your own and your group's learning efforts.

What you should expect from me:
- To teach fundamental physics concepts in a clear, organized manner to help you become competent and confident problem solvers. At the expense of skipping some of the later topics, I will reserve the option of slowing down the pace of the course according to the students' needs.

- To administer at least two feedback questionnaires, to better gage your perceptions of the course.
- To encourage group learning in lecture with frequent conceptual questions to be discussed in groups. Research on how people learn physics STRONGLY indicates that lecture alone is NOT an effective way to learn. Effective learning requires you to be active in the classroom and interact with myself and your classmates.
- To incorporate demonstrations into lectures, students learn in a variety of ways.
- To expeditiously grade and return material and exams to you.

How to be successful in physics:

- Work both independently *and* in groups of your peers who can help you (and be helped to) understand the course material. If you need help finding a group of classmates to work with, I will help connect you.
- Take each exam at the scheduled time. If you have a scheduling conflict due to a University-sponsored activity, it is your responsibility to inform me well before the date of the exam.
- Spend approximately 2-3 hours outside of class doing homeworks and reading the text for each hour you spend in lecture. For a 4-credit class this is something like 8-12 hours every week outside of class! I know may sound like a lot, see me if you don't know how you would fill that time. If you are spending more time than this, please see me so I can help you spend your time efficiently.
- Work many problems beyond the assigned homework. As with everything, practice, practice...
- Attend every class period. The experiential learning that will happen during every class period cannot be replaced by reading slides or the text book. That said, class notes will be available online for review purposes.

Class Schedule - Your Roadmap to Learning Mechanics (exact dates subject to change)

Week	M	W	F	Notes
Jan 28	Intro	Ch 2:1-2	Ch 2:3-4	Homework #0 (for practice) due Friday, Feb 1
Feb 4	Ch 2:5-6	Ch 3:1-2	Ch 3:3-4	Homework #1 is due Feb 8
Feb 11	Ch 3:5-6	Ch 4:1-2	Ch 4:3-4	Homework #2 is due Feb 15
Feb 18	Ch 4:5-6	Ch 5: 1-2	Ch 5: 3-4	Homework #3 is due Feb 22
Feb 25	Ch 5:5	Ch 6:1	Ch 6:2-3	Homework #4 is due Mar 1
Mar 4	Ch 6:4	Ch 7:1	Ch 7:2-3	Homework #5 is due Mar 8
Mar 11	Ch 7:4-5	Ch. 8:1-2	Ch. 8:3-4	Homework #6 is due Mar 18 Exam 1 is Thursday, Mar 14, 5:10-6:40 p.m On Chapters 2-6
Mar 18	SB	SB	SB	Spring Break
Mar 25	Ch. 8:5-6	Ch 9:1-2	Ch 9:3-4	Homework #7 is due Mar 29
Apr 1	Ch 9:5-6	Ch 10:1-2	Ch 10:3-4	Homework #8 is due Apr 5
Apr 8	Ch 10:5-6	Ch 12:1-2	Ch 12:3-4	Homework #9 is due on Apr 12
Apr 15	Ch 12:5-6	Ch 13:1-3	Ch 13:4-6	Homework #10 is due on Apr 22 Exam 2 is Thursday, April 18, 5:10-6:30 p.m. On Chapters 7,8,9,10
Apr 22	Ch 14:1-2	Ch 14:3-5	Ch 14:6-8	Homework #11 is due on Apr 26
Apr 29	Ch 15:1-2	Ch 15:3-4	Ch 15:5-8	Homework #12 is due on May 3
May 6	Catchup/student topics	Catchup/student topics	Review	Homework #13 is due May 10
May 15		Final Exam		Cumulative Final Exam Wednesday May 15 **10:15 - 12:15** in our normal classroom

Class Resources/References

Pre-requisites: MATH2200 (calc I) as pre- or co-req.
USP: This course satisfies a PN for USP2015.

Required Materials: Textbook: Sears & Zemansky's *University Physics*, 14th (or 13th or 12th; WARNING; CHAPTER NUMBERS 12,13,14 HAVE CHANGED in the 14TH EDITION) edition, by Young & Freedman (Section 1, Mechanics : Chapters 1 – 16). **The electronic text is available in WyoCourses free of charge**. If you wish to buy an unbound 3-hole hardcopy version of the text go into WyoCourses to the "Mastering Study Area:, click on "eText" and then use the link for "buy an unbound version".
Course Handout Pack (contains inclass problems and discussion materials): Available at bookstore.

Grading: (Subject to revision):

		Scale:
Exams: (41%)	3 @ 200 pts each	A: (>90%)
Final Exam: (21%)	1 @ 300 pts	B: (80-90%)
Homeworks: (21%)	best 10 of 13 @ 29 pts each	C: (70-80%)
Experiments: (17%)	best 7 of 8 @ 40 pts each	D: (60-70%)
	Total: 1470 points	F: (<60%)

Extra Credit: Up to 25 pts extra credit (this is like 2% of the course total, so it can raise your percentage up to 2%) 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. This is all-or-nothing. To earn 25 points, attendance needs to be very nearly perfect (no more than 2 absences) and you must complete very nearly every homework and lab (no more than ~1 missing of each).

Attendance: You are expected to attend class every day. Missing class will inevitably result in missing key class materials, including labs, for which there are no make-ups.

A Note about Grades: Your grade in this course reflects only your physics performance over a 15 week period on a limited set of questions. Your grade does not reflect your worth as a person or what I think of you. Because of the limited scope of this course, your grade is unlikely to reflect the range of your abilities in oral communication, writing, enthusiasm, logic, creativity, perseverance, entrepreneurial spirit, and a host of other talents which are crucial for your career.

Exams

Homeworks will contain mostly quantitative problems, whereas lectures will provide you with largely conceptual, multiple-choice questions to tackle in class. Hence, the exams will contain both quantitative and conceptual problems, and have both multiple-choice and written formats. The exams will be closed book and closed notes. You may use a calculator. **No make up exams will be given without advance request.** If you have a conflict with an exam time, you must make prior arrangements with the instructor.

Partial credit: One negative aspect of the multiple-choice format is its "all-or-nothing" nature. For this course's exams and quizzes, you may alternatively earn partial credit on a multiple-choice problem by opting to select two of the possible answers. For example, if you answer both A and C on a 4 point question that has the possible choices of A,B,C,D, you will earn 2 points if either answer A or C is the correct solution.

All examinations are required and none of the scores will be dropped or replaced. Exam dates should not conflict with MATH, but if they do let me know. The exams will be held at the following times, and cover the following chapters in *Young & Freedman*:

- Exam 1 - Thursday, March 14 -- 5:10-6:40 p.m. Ch 2-6 CR214 (week 7)
- Exam 2 - Thursday, April 18 -- 5:10-6:40 p.m. Ch 7-12 in CR214 (week 11)
- Final Exam: Wednesday, May 15th, 10:15 a.m. cumulative, in our daily classroom

Homework

The assignments will be posted on-line via the WyoCourses website. Students are encouraged to work together, but each student must submit their own work. Homeworks will consist of approximately 10 problems each week. About eight will be answered and graded online, and two will be turned in on paper to be returned promptly after grading. The deadline for each homework will be indicated; the on-line questions will need to answered by the start of class on the due date, and written problems are due in person at the start of the same class. For the written exercises: As in your future professional world, you should give credit to any sources or people you find helpful. For example, if you work on a problem in a group, the names of all the other members in that group should be given. To receive full credit, your homework must be legible and the logic must be easy to follow. Homework and lab scores decline 10% for each 2 hours late to a minimum of 20%. Neither faxed nor e-mailed homework will be accepted. Please staple loose sheets together.

MasteringPhysics advice and information:

- You will be able to submit each answer unlimited times, and partial credit can be earned even after five attempts (however, for multiple choice problems you only get credit before you have guessed as many times as there are options). Please hit "submit" after answering *each* question. Selecting "submit problem" will result in the problem being graded. 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 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.
- Parameters may be randomized! Your friend's question may have different numbers!
- There is a 2% tolerance for answers; e.g. you can be off by, say, 1.8% and receive full credit.

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

Academic Honesty

"Academic dishonesty will not be tolerated in this class. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an "F" on an exam, an "F" on the class component exercise, and/or an "F" in the entire

course. Academic dishonesty means anything that represents someone else's ideas as your own without attribution. It is intellectual theft – stealing - and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person's writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced information. Facilitation of another person's academic dishonesty is also considered academic dishonesty and will be treated identically."

Special accommodations

"The University of Wyoming is committed to providing equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or udss@uwyo.edu. It is in the student's best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: www.uwyo.edu/udss "

Duty to Report: UW faculty and I are committed to supporting students and upholding the University's non-discrimination policy. Under Title IX, discrimination based upon sex and gender is prohibited. If you experience an incident of sex- or gender-based discrimination, we encourage you to report it. While you may talk to a faculty member, understand that as a "Responsible Employee" of the University, the faculty member MUST report information you share about the incident to the university's Title IX Coordinator (you may choose whether you or anyone involved is identified by name). If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are people who can meet with you. Faculty members and I can help direct you or you may find info about UW policy and resources at http://www.uwyo.edu/reportit You do not have to go through the experience alone. Assistance and resources are available, and you are not required to make a formal complaint or participate in an investigation to access them.

Additional help and campus resources

- STEP Tutoring Center in Coe Library is open Sunday-Thursday 6-9 p.m. www.uwyo.edu/step
- *DISABILITY SUPPORT SERVICES: udss@uwyo.edu, 766-3073, 128 Knight Hall, www.uwyo.edu/udss*
- *COUNSELING CENTER: uccstaff@uwyo.edu, 766-2187, 766-8989 (After hours), 341 Knight Hall, www.uwyo.edu/ucc*
- *ACADEMIC AFFAIRS: 766-4286, 312 Old Main, www.uwyo.edu/acadaffairs*
- *DEAN OF STUDENTS OFFICE: dos@uwyo.edu, 766-3296, 128 Knight Hall, www.uwyo.edu/dos*
- *UW POLICE DEPARTMENT: uwpd@uwyo.edu, 766-5179, 1426 E Flint St, www.uwyo.edu/uwpd*

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

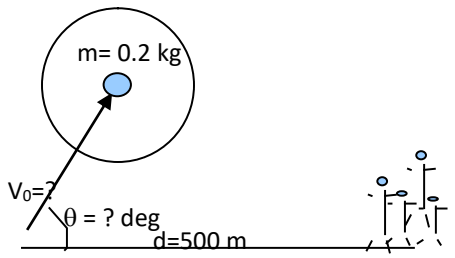
A. Use dimensional analysis to check the units of your solution equation.
B. Insert numerical values into your equation and evaluate a solution.
C. Check that the answer contains both a numerical value and correct units (e.g., m/s)
D. Evaluate whether your answer is reasonable (not too small or large?)

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

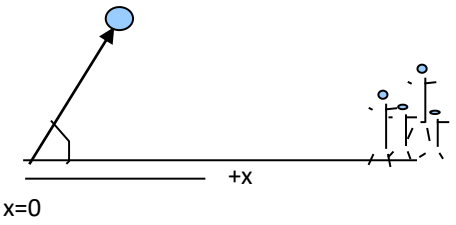
launch angle = ? degrees

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

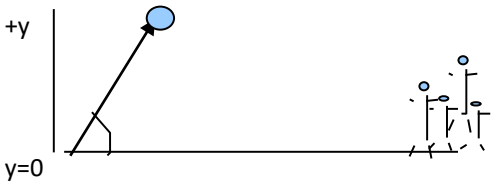
Approach: use ballistic trajectories acting under gravity to find path of firework as a function of time and see where it lands after 9 s.

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

Diagram axes and define variables



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



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

Name(s) _____

Problem-Solving Strategy

1. Identify the Problem

Picture of problem

Given information:

Problem to be solved:
General Approach:

2. Set Up the Physics

Diagram axes and define variables

Target variables:
Relevant Equations:

3. Solve the Problem

Construct specific equations

Outline the solution

Solve for target variables

4. Evaluate your Solution

Units of solution correct?:
Insert numerical values:

Answer reasonable? Correct units?

```
# define a variable
x=1.5
# do a computation
y=2*x+1
# show the value of y
y
# compute the sine and cosine of pi using the built-in pi variable
# note that arguments to trig functions are in radians
y=sin(pi)
 x=cos(pi)
# or use degrees
y=sin(30. *pi/180)
y=cos(30. *pi/180)
# define an array of numbers, the integers 1 through 10
x=[1,2,3,4,5]
 # or shorthand
x=1:5
# or define an array from 1 to 10 in steps of 0.5
x=1:0.5 : 5
# use this array in a computation to make another array
y=sqrt(x)+1.5

# plot this function y versus x using red circles
plot(x,y,'ro')
# turn on hold feature so overplot new data without erasing
hold on
# make a new function; note the special use of the period after the x to indicate that x is to be treated as a real number array #
instead of a matrix
z=x.^2 -1. +sin(5*x *180./pi )
# plot z versus x with blue x's
plot(x,z,'bx')
# plot same points but with a red line
plot(x,z,'r')
#label the plot
xlabel('time (seconds)')
ylabel('Distance (meters)')
# annotate the plot
text(3.5,10.1,'This is my plot')
 # add some error bars; suppose the errors are sqrt(z)
E=sqrt(z)
errorbar(x,z,E)

# hold off to draw new plot next time
hold of

# make a hardcopy or save a jpeg of your plot using the menu items
# for help on a procedure like plot simply type
help plot
#    and read all the ways you can use that function

 #sum up all the elements of the array x
sum(x)
# compute the standard deviation or rms of x
std(x)
# create a set of data values from which to make a histogram
y=[1,3,4,3,5,2,3,4,6,3,4,1,3,4,6,3,4]
# define centers of x bins at which to make histogram plots
```

```
x=0: 0.25 :6
hist(y,x)
# make a random set of numbers centered on 3.0
z=randn(100) +3.0
# plot this histogram
hist(z,x)
```

Other matlab tricks:

Use the up-arrow key to redo or modify previous commands
Use the menus to open a new script file and save all of your commands as *.m files for running later with the green arrow in the script editor window.