

PS 122 - Physical Science for Teachers
Spring, 2018

Time: Tues./Thur. 12:00 pm - 1:50 pm, S179
Instructor: Dr. Jon M. Saken
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Phone: 696-2753
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Office Hours: Mon. - Thurs. 10:00-11:00 am, or by appointment
Final Exam: Tues., May 1, 12:45 pm - 2:45 pm
Required Text: *Ranking Task Exercises in Physics*, Okuma, Maloney & Hieggelke
MasteringPhysics access card

Catalog Description: PS 122 is part of a 3 course sequence of Physical Science for K-9 Education majors. Includes 2-hr, 1 credit lab. (*3 hours*)

Fuller Course Description: PS122 is a survey of introductory physics, particularly focused on content related to the Next Generation Science Standards (NGSS). It is designed to provide the physics background (motion, forces, energy, electricity & magnetism, light & waves) required for K-9 Education majors, as well as provide practice in the applied engineering principles included in these new standards.

Grading:	Homework	10%	A	90 - 100
	Tests (3)	45%	B	80 - 89
	Quizzes	15%	C	70 - 79
	Journal	10%	D	60 - 69
	Final Exam	20%	F	0 - 59

Homework: Homework will be conducted using the textbook publisher's online system, *Mastering Physics*. An access card is available at the campus bookstore or you may pay for an access code online. **Please note that the access code is different from the course ID#:** PS122SPRING18

A Note on Homework: Please do the homework. Please allow enough time on the homework so that you can think about your responses and pay close attention to the questions. It is not intended to be mere busy work but is instead an important part of the learning experience. Believe it or not, education research has been conducted to show what may be obvious - students who do the homework for themselves (not copying off of someone else or looking up the answers online) do much better in the class.

I can't make you do the homework. I can't make sure that you always do it for yourself. But I can guarantee that you will severely lower your chances of getting a good grade, or even passing, if you don't do the homework. *So, please do the homework.*

Quizzes: Short quizzes will be conducted at the beginning of class most Thursdays. Although they will be focused on recent material, knowledge of prior material is considered "fair game." **Note that late-comers will not be permitted to take the quiz.** The lowest quiz grade will be dropped.

Exams: A total of three (3) exams covering will be conducted throughout the semester. Material from the lab investigations *WILL* be included on the exams.

Journals: All of your experimental work on the investigations will be kept in your science journal, as well as your conclusions on the results. Please note: even though you will often be given handouts describing the lab activity, **ALL notes, data, results, conclusions MUST go in your journal.**

In addition you will be asked periodically to reflect on the assignments and comment on your learning process. Although I will periodically review your journals and offer feedback, you are encouraged to discuss your writing with me at any time.

Final Exam: The final exam *WILL* be cumulative.

University Policies:

By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to: <http://www.marshall.edu/academic-affairs/policies/>

Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Attendance Policy: Regularly attending class is crucial to your success, as many of the class activities are interactive. Being on time for class and attending all class meetings is expected. Period. Excessive absences - whether excused or unexcused - may affect your ability to earn a passing grade.

Excused Absences - Students who miss interactive activities with an excused absence will be provided with an alternative assignment that connects to the activities in the missed class session.

Unexcused Absences

- If you miss two classes, expect an email/notification from your instructor.
- If you miss a third class, you will face:
 - Automatic one letter grade deduction in the course.
 - Mandatory meeting with instructor. At the instructors discretion, you may develop a plan of improvement, and if you meet its criteria, you may have the chance to potentially earn back the letter grade deduction. Keep in mind this option is at the instructor's discretion.
- If you miss a fourth class, the previous letter grade deduction stands. (Improvement plan will not change this grade.)
- Subsequent missed classes will result in additional letter grade deductions.

Other Course Policies:

- Any work handed in late will suffer a 20% penalty per **calendar** day. This does not apply for any day for which there is an excused absence.
- Makeup work will **NOT** be allowed except for *documented* emergencies.

- If you must miss a class contact me immediately. Also, be sure to let me know at least a week ahead of time if a university activity will require an absence from class.
- Cell phone use is not permitted in the classroom. Please turn cellphones to OFF or vibrate while in class.
- Except for calculators, *all other electronic devices must be turned off in class*. Laptops, tablets, etc.
- Any act of academic dishonesty of any kind will result in a final grade of F for the class.

Course Schedule: (Subject to change.)

Week	Dates	Subject(s)	Workbook pgs.
1	Jan 9 & 11	Vectors; Kinematics	1-13
2	Jan 16 & 18	Newton's Laws	14-45
3	Jan 23 & 25	Circular Motion; Momentum	46-55; 74-82
4	Jan 30 & Feb 1	Work & Energy; Torque & Equilibrium	56-73
5	Feb 6 & 8	Rotational Motion; Test Review	83-90
6	Feb 13 & 15	<i>Test #1, Feb 13</i> ; Electric Charge & Force	122-126; 134-136; 143-144
7	Feb 20 & 22	Electric Field; DC Circuits	127; 132; 137-142; 155-179
8	Feb 27 & Mar 1	Magnetism; Induction	180-195
9	Mar 6 & 8	Basic Gas Laws; Fluids	98-108; 110-114
10	Mar 13 & 15	Test Review; <i>Test #2, Mar 15</i>	...
Spring Break: Mar 19 - 23			
11	Mar 27 & 29	1st & 2nd Laws of Thermodynamics	...
12	Apr 3 & 5	Vibrations; Mechanical Waves	96-97; 196-207
13	Apr 10 & 12	Reflection & Refraction; Mirrors & Lenses	208-216
14	Apr 17 & 19	Test Review; <i>Test #3, Apr 19</i>	...
15	Apr 24 & 25	Interference; Diffraction; E&M Waves	217-218
<i>Final Exam: Tues., May 1, 12:45 - 2:45 pm</i>			

Learning Outcomes:

Practice: Homework & Investigations

Assessment: Unit Exams & Final Exam

Outcomes:

- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a force.
- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- Support an argument that the gravitational force exerted by Earth on objects is directed down.
- Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object
- Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- Define a simple design problem that can be solved by applying scientific ideas about magnets.
- Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

- Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
- Generate and compare multiple solutions that use patterns to transfer information.
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.