Point Loma Nazarene University
PSC111: Physical Science for Teachers (4 hr) Fall 2017

	Departments of Chemistry and Physics & Engineering Class Meetings: 1:30-2:35 MWF in Taylor 106	
Instructor:	Dr. Matthieu Rouffet	Dr. Paul Schmelzenbach
email:	matthieurouffet@pointloma.edu	PaulSchmelzenbach@pointloma.edu
Office Hours:	2:30-4:30 T Th F	8:30-9:45; 12:15-1:15 MWF, by appt.
Office :	RS305C; 849-3278	RS207; 849-2933

Materials – *Physical Science* by Bill Tillery, 10th edition, and a calculator

Description – An introductory survey of selected principles in physics and chemistry with a discussion of related societal and environmental issues. This course focuses on topics necessary for the California multiple subject teaching credential (K-8). This class is highly interactive and will make use of many hands on activities. Meets a general education requirement; does not count toward the Chemistry or Physics major.

Learning Outcomes – This course is one of the components of the General Education Program at Point Loma Nazarene University, in support of the general education learning outcome: Quantitative Reasoning: Students will be able to solve problems that are quantitative in nature. The purpose of general education is to provide a common educational experience, to develop essential skills, and to provide a broad cultural background for personal and professional growth. Within these broader outcomes, in this course you will

1. explain everyday observations of the natural world in terms of chemistry and physics.
2. translate the description of problems into the equations required to solve them using relevant physical principles.
3. find solutions to problems once appropriate equations or techniques are identified.
4. create and interpret graphical representations of quantities
5. recognize appropriate teaching techniques to convey scientific ideas and practices
6. develop content expertise in the "Physical Science Disciplinary Core Ideas" described in the Next Generation Science Standards, specifically:
   (a) understand the physical properties of solids, liquids, and gases, such as color, mass, density, hardness, and electrical and thermal conductivity
   (b) know that matter can undergo physical changes (e.g., changes in state such as the evaporation and freezing of water)
   (c) know that matter can undergo chemical changes (i.e., atoms in reactants rearrange to form products with new physical and chemical properties)
   (d) understand conservation laws with respect to matter and energy.
   (e) know that matter consists of atoms and molecules in various arrangements
   (f) can give the location and motions of the parts of an atom (protons, neutrons, and electrons)
   (g) can describe the constituents of molecules and compounds, naming common elements (e.g., hydrogen, oxygen, iron)
   (h) explain how elements are organized on the periodic table on the basis of the characteristics of atoms and their chemical properties
   (i) can describe characteristics of solutions (such as acidic, basic, and neutral solutions)
   (j) know examples with different pH levels, such as soft drinks, liquid detergents, and water

(k) know that mixtures may often be separated based on physical or chemical properties.

(l) describe an object's motion based on position, displacement, speed, velocity, and acceleration

(m) know that forces (pushes and pulls), such as gravity, magnetism, and friction, act on objects and may change their motion if these forces are not in balance

(n) know that "like" electrical charges or magnetic poles produce repulsive forces and "unlike" charges or poles produce attractive forces

(o) describe simple machines in which small forces are exerted over long distances to accomplish difficult tasks (e.g., using levers or pulleys to move or lift heavy objects)

(p) identify forms of energy, including solar, wind, chemical, electrical, magnetic, nuclear, sound, light, and electromagnetic

(q) explain conservation of energy resources in terms of renewable and nonrenewable natural resources and their use in society.

(r) know that total energy in a system is conserved but may be changed from one form to another, as in an electrical motor or generator, and that speed and energy are related

(s) understand the difference between heat (thermal energy) and temperature, and understand temperature measurement systems

(t) know how heat may be transferred by conduction, convection, and radiation (e.g., involving a stove, Earth's mantle, or the sun)

(u) describe sources of light, including the sun, lightbulbs, or excited atoms (e.g., neon in neon lights)

(v) interactions of light with matter (e.g., vision, photosynthesis)

(w) describe the properties of waves (e.g., wavelength, amplitude, frequency) and applications and technologies associated with these properties.

(x) know and can apply the optical properties of waves, especially light and sound, including reflection (e.g., by a mirror) or refraction (e.g., bending light through a prism)

Preclass: Learning physics and chemistry requires active learning and participation during class. In preparation for each class meeting there is a reading assignment to help you be prepared. To complete the reading assignment you must answer three questions and submit them electronically by 10 pm the evening before class. Late submissions will not be accepted. This electronic communication is so important because it is your voice in what material we emphasize during class meetings and provides us constant feedback of your understanding of the material. These submissions will be graded on the following scale: 2=demonstrates reading, 1=room for improvement, 0=unsatisfactory. These points are accumulated and are worth 5% of the final grade.

Homework – Most weeks there will be homework due, to practice applying problem solving techniques. Homework is worth 20% of your final grade. Practicing working problems is critical to your success in the class. Late homework will not be accepted unless their is a documented emergency.

Activities – Several activities will be carried out through the semester including both hands-on applications of physical science as well as the opportunity to practice aspects of teaching. Activities often take place during the class meeting and cannot be made up, unless arrangements were made with the professor before the lab.

Exams – Four examinations will be given during the semester. The final examination is on Monday, December 16 at 1:30 pm. Exams cannot be made up, unless under extreme circumstances discussed and arrangements made with the professor before the exam.

Final Grades – The grade you earn in this course is based on the scale shown to the right. The points you receive during the course are weighted accordingly:

- Preclass: 5%
- Homework: 20%
- Activities: 25%
- Tests (4): 30%
- Final Exam: 20%

A	100 - 91.0
A-	91.0 - 89.5
B+	89.5 - 87.5
B	87.5 - 81.0
B-	81.0 - 79.5
C+	79.5 - 77.5
C	77.5 - 71.0
C-	71.0 - 69.5
D+	69.5 - 67.5
D	67.0 - 61.0
D-	61.0 - 57.0

University Mission: Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission: Within this broader mission, the Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

Attendance– Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day. Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class Attendance in the Undergraduate Academic Catalog.

Academic Honesty – Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic Honesty for definitions of kinds of academic dishonesty and for further policy information.

Academic Accommodations –If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See Disability Resource Center for additional information. For more details see the PLNU catalog: http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic Accommodations. Students with learning disabilities who may need accommodations should discuss options with the instructor during the first two weeks of class.

Class Enrollment – It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Credit Hour – In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 4 unit class delivered over 16 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Final Exam – The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in th course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

Copyright Protected Materials – Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

Calendar for The Physics Section (Chemistry Section to Follow)

	Topics	Reading
8/30	Introductions - Teaching - Science	
9/1	Forces and Motion I	2.1-2.3
9/4	Forces and Motion II	2.4-2.6
9/6	Forces and Motion III	2.7-2.9
9/8	Energy I	3.1-3.3
9/11	Energy II	3.3-3.4
9/13	Heat and Temperature I	4.1-4.3
9/15	Heat and Temperature II	4.4-4.5
9/18	Review and NGSS	
9/20	Exam 1	
9/22	Waves and Sound	5.1-5.4
9/25	Waves and Sound	5.4-5.6
9/27	Electricity	6.1-6.2
9/29	Electricity II	6.3-6.4
10/2	Electricity III	6.5-6.6
10/4	Electricity III	6.5-6.6
10/6	Light I	7.1-7.2
10/9	Light II	7.3
10/11	Review and NGSS	
10/13	Teaching a Lesson	
10/16	Exam 2	