Point Loma Nazarene University PHY 241 -- University Physics I 4 Units Fall 2018

PLNU Mission Statement

To Teach ~ To Shape ~ To Send

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.

Professor: Dr. Heide Doss
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E-mail: plnuPhysicsDoss@gmail.com or hdoss@pointloma.edu (response time faster for first email)
Office Hours: MWF 11:00 AM – 12:00 AM (office), Th 12:30 PM-2:30 PM (LA2) or by appointment. NOTE if you really need to see me I will also be around MF from about 10:00AM to 11:00AM but this is also around Chapel time – so you'll have to make up Chapel one evening.

Regular meeting times Aug 28, 2018 – December 7, 2018 (NOTE: T 8/28 is a M schedule**)**
Lecture: MWF 1:30 PM – 2:25 PM (LA 2)
Labs: Section 1: Th 10:00 AM – 11:55 AM (LA 2)
Final Exam: Wednesday, Dec 12, 1:30 PM to 4:00 PM (LA 2)

Required Items:
Textbook: Physics for Scientists and Engineers Volume 1 by Douglas Giancoli, 4th edition, Pearson/Prentice Hall 2009. (NOTE: PHY 241 covers Volume 1, PHY 242 covers Volume 2, PHY 304(modern) uses a different textbook.)

Access to Mastering Physics - Course Name: PHY 241 Fall 2018, **Course ID:** MPDOSS74247
IMPORTANT NOTE - it is usually cheaper and definitely easier and faster to buy access directly from Pearson's mastering website (www.masteringphysics.com). **You will need access right away**.

A scientific calculator (not a phone app) is also needed for this course.

Course Description:
An analytic, calculus-based study of classical physics appropriate for science and engineering majors. Includes mechanics, waves, and thermodynamics. Lecture and laboratory. Not repeatable. Offered in the spring. Letter grading. 4 units.

Corequisite(s): MTH 144 or MTH 164 or consent of instructor.

PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and cultures.

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.

Student 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. translate the description of physics problems into the mathematical equations required to solve them using relevant physical principles
2. calculate solutions to physics problems once appropriate equations or techniques are identified
3. predict reasonable answers in appropriate problems, and assess the reasonableness of calculated answers
4. explain the physical meaning of the parameters in introductory physics equations
5. create and interpret graphical representations of physical quantities
6. gather and interpret data in a lab setting

Labs: Weekly lab meetings will provide you the opportunity for hands-on experience of topics from class meetings, improve lab technique, and data analysis. Labs will be preformed in small groups, but each individual is responsible for submitting their own results. Labs are due at the end of the lab period. Labs are worth 20% of your overall grade with the additional requirement that *you must pass the lab portion of the class to pass the class*.

Pre-class Assignments: Reading and pre-class questions are due by 9:00 AM, except for the first class. The pre-class questions are in Mastering Physics at www.masteringphysics.com. These usually consist of 3 items (questions and simple problems) based on the reading assignment. Late submissions will not be accepted. Pre-class assignments are 5% of the overall grade. Some pre-class assignments have extra-credit points.

Homework: Weekly assignments include reading, pre-class questions found in Mastering Physics at www.masteringphysics.com, and end-of chapter problems in Mastering Physics at www.masteringphysics.com. The end-of-chapter problems along with any graded classwork comprise the 10% of your overall grade labeled as "Homework" and are due by 11:59 PM on the due date listed in the syllabus. Points earned during class and class projects that might come up during the semester will also be included in the homework grade. Classwork cannot be made up.

Late Work: Late work will not be accepted unless there is a documented emergency. Assignments are due as noted on the syllabus, in class, and on Mastering Physics. Incompletes are only assigned in extremely unusual circumstances.

Exams: There will be five in-class exams during the semester (each worth 9% of your overall grade) and one comprehensive final exam (worth 20% of your overall grade). Partial credit for non-multiple choice problems will be given for correct reasoning at any step of a problem, but only if it is communicated clearly enough for me to understand. For problems that call for solution or explanation, no credit will be given for an answer alone; the method or reasoning must also be shown. No make-up exams are allowed except for warranted circumstances.

You must take ALL the exams and the final in order to pass the class.

Missed Exam Policy: No make-up exams are allowed except for warranted circumstances. Arrangements must be made with me as soon as possible.

Final Exam: Date and Time: Final Exam: Wednesday, Dec 12, 1:30 PM to 4:00 PM
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 the 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.

Final Grade: The points you receive during the course are weighted accordingly:

Component	**Weight**
Pre-Class	5%
Homework	10%
Lab	20%
Exams (4)	45% (equally weighted)
Final Exam	20%

The grade you earn in this course is based on the following scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-
S≥ 91.5	91.5 >S≥ 89.5	89.5 >S≥ 86.5	86.5 >S≥ 82.5	82.5 >S≥ 79.5	79.5 >S≥ 76.5	76.5 >S≥ 72.5	72.5 >S≥ 69.5	69.5 >S≥ 66.5	66.5 >S≥ 62.5	62.5 >S≥ 59.5

Department 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.

PLNU Attendance and Participation Policy:
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.

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.

Academic Accommodations:
While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center. (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

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 any 4 unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

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.

PLNU Academic Honesty Policy:
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.

FERPA Policy: In compliance with federal law, neither PLNU student ID nor social security number should be used in publicly posted grades or returned sets of assignments without student written permission. This class will meet the federal requirements by distributing grades and papers individually. Also, in compliance with FERPA, you will be the only person given information about your progress in this class unless you have designated others to receive it in the "Information Release" section of the student portal. See Policy Statements in the undergrad academic catalog.

Tentative Syllabus – subject to updates
Pre-class assignments due by 9:00 am on day of class. Homework assignments due by 11:59 pm.

Date	Topics	Assignments	Labs (Th LA 2)
8/28/18 T = **Monday schedule**	Intro; Nature of Science; Models, Theories, and Laws; Measurement and Uncertainty – sig figs; Units, Standards, and the SI System	1.1-1.4 pre-class 1 (in class) HW Intro MP due 8/30 HW Ch 1 due 8/31	
8/29/18	Converting Units, Order of Magnitude, Estimating, Dimensions and Dimensional Analysis. Reference Frames and Displacement, Average Velocity, Instantaneous Velocity, Acceleration	1.5-1.7, 2.1-2.4 pre-class 2 due HW ch 1 due HW ch 2	Lab 1: Uncertainty
8/31/18 F	Motion at constant acceleration, solving problems, freely falling objects, variable acceleration; integral calc, graphical analysis & numerical integration	2.5-2.9 pre-class 3 due HW ch 1 due HW ch 2 due 9/5	
9/3/18 M	**NO CLASSES – LABOR DAY**		
9/5/18 W	Vectors and scalars, addition of vectors- graphical methods, subtraction of vectors, and multiplication of a vector by a scalar, adding vectors by components, unit vectors, vector kinematics	3.1-3.6 pre-class 4 due HW ch 2 due HW ch 3	Lab 2: Motion
9/7/18 F	Vector kinematics, projectile motion, solving projectile motion problems, relative velocity.	3.6-3.9 pre-class 5 due HW ch 3	
9/10/18 M	Force, Newton's first law of motion, mass, Newton's second law, Newton's third law	4.1-4.5 pre-class 6 due HW ch 3 due	
9/12/18 W	force of gravity, normal force, solving problems, free body diagrams**,** applications of Newton's Laws involving friction,	4.6-4.8, 5.1 pre-class 7 due HW ch 4 due 9/13	Lab 3: Forces
9/14/18 F	**TEST 1 Chapters 1, 2, 3, 4, 5.1**	pre-class 8 due	
9/17/18 M	Uniform circular motion, dynamics of uniform circular motion, highway curves: banked and unbanked, nonuniform circular motion, velocity-dependent forces: drag & terminal velocity	5.2-5.7 pre-class 9 due HW ch 5	

Date	Topics	Assignments	Labs (Th LA 2)
9/19/18 W	Newton's law of universal gravitation, vector form of Newton's law of universal gravitation, gravity near the Earth's surface: geophysical applications, Satellites and weightlessness	6.1-6.4 (6.5-8) pre-class 10 due HW Ch 5 due HW Ch 6	Lab 4: Frictional Forces
9/21/18 F	Kepler's laws and Newton's synthesis, gravitational field, types of forces in nature, principle of equivalence: curvature of space; black holes	6.5-6.8, (7.1-4) pre-class 11 due HW ch 6	
9/24/18 M	Work done by a constant force, scalar product of two vectors, work done by a varying force, kinetic energy and the work-energy principle	7.1-7.4 Pre-class 12 due HW ch 6 due HW ch 7	
9/26/18 W	Conservative & nonconservative forces, potential energy, mechanical energy and its conservation, problem solving using conservation of mechanical energy, the law of conservation of energy	8.1-8.5 pre-class 13 due HW ch 7 due HW ch 8	Lab 6: Energy Conservation
9/28/18 F	energy conservation with dissipative forces: solving problems, gravitational potential energy & escape velocity, power, potential energy diagrams; stable and unstable equilibrium	8.6-8.9 pre-class 14 due HW ch 7 due HW ch 8	
10/1/18 M	Catch up / Review	pre-class 15 due HW Ch 8 due	
10/3/18 W	**Test 2 Chapters 5,6,7,8**	pre-class 16 due	Lab 5: Air Resistance
10/5/18 F	Momentum & its relation to force, conservation of momentum, collisions & impulse, conservation of energy & momentum in collisions, elastic collisions, inelastic collisions	9.1-9.6 pre-class 17 due HW ch 9	
10/8/18 M	Collisions in 2 or 3 dimensions, center of mass, center of mass & translational motion, systems of variable mass; rocket propulsion	9.7-9.10 pre-class 18 due HW ch 9	
10/10/18 W	Angular quantities, vector nature of angular quantities, constant acceleration, torque, rotational dynamics; torque & rotational inertia, solving problems in rotational dynamics	10.1-10.6 pre-class 19 due HW ch 9 due	Lab 7: Momentum Conservation

Date	Topics	Assignments	Labs (Th LA 2)
10/12/18 F	Determining moments of inertia, rotational kinetic energy, rotational plus translational motion; rolling, Why does a rolling sphere slow down?	10.7-10.10 pre-class 20 due HW ch 9 due Ch 10	
10/15/18 M	Angular momentum-objects rotating about a fixed axis, vector cross product; torque as a vector, angular momentum of a particle, angular momentum & torque for a system of particles; general motion	11.1-11.4 pre-class 21 due HW ch 10 due HW ch 11	
10/17/18 W	Angular momentum & torque for a rigid object, conservation of angular momentum, the spinning top & gyroscope, rotating frames of reference; inertial forces, the Coriolis Effect.	11.5-11.9 pre-class 22 due HW Ch 10 due HW ch 11	Lab 8: Rolling Motion
10/19/18 F	**Fall Break Day, No Classes**		
10/22/18 M	Conditions for equilibrium, solving statics problems, stability & balance, elasticity; stress & strain, fracture, trusses & bridges, arches & domes	12.1-12.7 pre-class 23 due HW ch 11 due HW ch 12	
10/24/18 W	Catch up / review	12.1-12.7 pre-class 24 due HW ch 12 due	Lab 9: Rotational Equilibrium
10/26/18 F	**TEST 3 CH 9,10,11,12**	pre-class 25 due	
10/29/18 M	phases of matter, density and specific gravity, pressure in fluids, atmospheric pressure & gauge pressure, pascal's principle, measurement of pressure: gauges & barometers	13.1-6 pre-class 26 HW ch 13	
10/31/18 W	Buoyance & Archimedes principle, fluids in motion; flow rate & the equation of continuity, Bernoulli's equation, applications of Bernoulli's principle: torricelli, airplanes, baseballs, tia, viscosity, flow in tubes, surface tension, pumps	13.7-13-14 pre-class 27 HW ch 13	Lab 10: Fluids
11/2/18 F	Oscillations of a spring, simple harmonic motion, energy in the simple harmonic oscillator, simple harmonic motion related to uniform circular motion	14. 1-14.4 pre-class 28 HW ch 13 due HW Ch 14	(Last day to drop classes)

Date	Topics	Assignments	Labs (Th LA 2)
11/5/18 M	The simple pendulum, the physical pendulum & the torsion pendulum, damped harmonic motion, forced oscillations	14.5-14.8 pre-class 29 HW ch 14	
11/7/18 W	Characteristics of wave motion, types of waves, energy transported by waves, mathematical representation of a traveling wave, the wave equation	15.1-15.5 pre-class 30 HW ch 14 due HW ch 15	Lab 11: Simple Harmonic Motion
11/9/18 F	The principle of superposition, reflection & transmission, interference, standing waves & resonance	15.6-15.9 pre-class 31 HW ch 14 due HW ch 15	
11/12/18 M	Characteristics of sound, mathematical representation of longitudinal waves, intensity of sound: decibels, sources of sound: vibrating strings and air columns, quality of sound& noise, interference of sound waves: beats	16.1-16.5 pre-class 32 HW ch 15 due HW ch 16	
11/14/18 W	interference of sound waves: beats, Doppler effect, shock waves & the sonic boom, applications: sonar, ultrasound, medical imaging / REVIEW	16.6-16.9 pre-class 33 HW ch 16	Lab 12: Musical Straws
11/16/18 F	**TEST 4 CH 13,14,15, 16**	pre-class 34 HW ch 16 due	
11/19/18 M	Atomic theory of matter, temperature & thermometers, thermal equilibrium and the zeroth law of thermodynamics, thermal expansion	17.1-17.5 pre-class 35 HW ch 17	
11/21/18 W	**No Classes 11/22-24**	**Thanksgiving recess**	No Lab
11/23/18 F	**No Classes 11/22-24**	**Thanksgiving recess**	
11/26/18 M	The gas laws and absolute temperature, the ideal gas law, problem solving with the ideal gas law, ideal gas law in terms of molecules: Avogadro's number	17.6-17.10 pre-class 36 HW ch 17	
11/28/18 W	The ideal gas law and the molecular interpretation of temperature, distributions of molecular speeds, real gases and changes of phase, vapor pressure & humidity, Van der Waals equ of state, mean free path, diffusion	18.1-18.7 pre-class 37 HW ch 17 due HW ch 18	Lab 13 Ideal Gas Law

Date	Topics	Assignments	Labs (Th LA 2)
11/30/18 F	Heat as energy transfer, internal energy, specific heat, calorimetry, latent heat, first law of thermodynamics	19.1-19.6 pre-class 38 HW ch 18 HW ch 19	
12/3/18 M	The first law of thermodynamics applied; calculating work, molar specific heats for gases & the equipartition theorem of energy, adiabatic expansion of a gas, heat transfer: conduction, convection, radiation	19.7-19.10 pre-class 39 HW ch 18 due HW ch 19	
12/5/18 W	The second law of thermodynamics, heat engines, reversible & irreversible processes, refrigerators	20.1 – 20.4 pre-class 40 HW ch 19 due	Lab 14 (or review session)
12/7/18 F	Entropy, entropy & the second law of thermodynamics, order to disorder, unavailability of energy: heat death Review	20.4 – 20.8 pre-class 41 HW ch 20 due 12/8	
12/12/18 W	**FINAL EXAM 1:30 PM - 4:00 PM**		
	Grades turned in by Dec 23		