

**Advanced Placement Physics**  
**AP Physics (S1, 0.5 cr.) - 344.11 (P8)**  
**Wisconsin Lutheran High School**  
**Fall 2022**

**Physics:** The world around us is in a state of constant change: the sun and moon rise and set, waves crash, mists rise, rain falls, fires burn, rocks form, and mountains crumble. Amidst all of these changes, there are certain patterns; there is a discernible order. The stars, the seas, the clouds, the rocks, and the earth itself each seem to have a particular *nature*. *Physics* is the careful study of the natures of things. In fact, the word *physics* literally means "natures" in the Greek language.

**Course overview:** Advanced Placement (AP) physics at Wisconsin Lutheran High School is a year-long introductory course for advanced (typically junior or senior level) students at Wisconsin Lutheran High School who want to better understand the natures of the things we see around us. Emphasis on theoretical topics, critical thinking, and problem solving makes this course quite challenging. Students must be strong in mathematics and science to be successful in this course. Students may have concurrent enrollment in Honors Trigonometry and Precalculus or department approval.

**Professor objective:** My aim this year is that you will come away from this course with an understanding and appreciation of first-year physics, and that you will be prepared to take the AP physics examination, should you so choose.

My goal is for you to succeed! Please do not hesitate to contact me with any problems you may run into this semester.

**Grade components:**

Classroom/lab participation	15%
Quizzes	35%
Midterm	20%
Final	30%

**Grading scale:**

A+	99-100%
A	95-98%
A-	93-94%
B+	91-92%
B	87-90%
B-	85-86%
C+	83-84%
C	79-82%
C-	77-78%
D+	75-76%
D	72-74%
D-	70-71%

**Course textbook:** The course will be organized around a book: the *Pocket Guide to accompany Physics for Scientists and Engineers* (4th edition) by Serway. (I'll call this PSE for short.) I would highly recommend obtaining a copy of this book. It is inexpensive, compact, and well-written. It will make a very handy addition to your home science library. If you don't want to buy it, I will have copies to loan out for the semester.

**Course time and location:** With few exceptions, the course meets every day (Monday through Friday) during the academic year from 2:17 until 3 pm in WLHS 223—in the science wing on the first floor of WLHS. See the WLHS academic calendar.

**Instructor:** Dr. Kuehn from the physics department of Wisconsin Lutheran College (WLC) is the professor for this course.

**Contact info:** [kerry.kuehn@wlhs.org](mailto:kerry.kuehn@wlhs.org), 414.443.8850, [www.kerrykkuehn.com](http://www.kerrykkuehn.com), [www.greatphysics.com](http://www.greatphysics.com)

**Teaching Assistants:** The Thursday course sections (beginning in August) will be overseen by two teaching assistants. Michael Sell and Zeke Micheel are upper-level physics majors from Wisconsin Lutheran College. Here is their contact info: [michael.sell@wlc.edu](mailto:michael.sell@wlc.edu), [ezekiel.micheel@wlc.edu](mailto:ezekiel.micheel@wlc.edu)

**Homework:** I will assign weekly homework problems. These are designed to deepen your understanding of lecture material and to prepare you for the quizzes and tests.

**Quizzes:** We will have in-class quizzes about every two weeks on Mondays. To prepare for quizzes, you should read the assigned book chapter (at least once), review the lecture material, complete all of the homework problems, and review the homework solutions.

**Tests:** We will have a midterm exam at the end of the first quarter and a comprehensive final examination at the end of the second quarter.

**Course websites:** In addition to the course information provided through WLHS's OnCampus system, we will be also using a website I've designed for this course: [www.greatphysics.com/AP/](http://www.greatphysics.com/AP/) Please refer to the following table and also the course website for an overview of the topics we'll be covering this semester. Suffice it to say here that we will be studying the first half (Chaps. 1-18) of Serway's *Physics for Scientists and Engineers* in the first semester, and the second half (Chaps. 19-38) in the second semester.

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**Weekly schedule (including readings, key topics, and laboratory activities)**

<b>Week</b>	<b>Serway Textbook Chapter</b>	<b>Key topics and laboratory activities</b>
<b>1</b>	1: measurement	units, dimensional analysis, measurement & estimation
<b>2</b>	1: measurement	lab experiment: pendular motion
<b>3</b>	2: motion in 1 dimension	displacement, speed, acceleration, kinematics
<b>4</b>	3: vectors	lab experiment: kinematics of rolling balls
<b>5</b>	4: motion in 2 dimensions	vector description of 2d kinematics, circular motion
<b>6</b>	4: motion in 2 dimensions	lab experiment: projectile motion
<b>7</b>	5: laws of motion	inertia, force, mass, acceleration, newton's laws
<b>8</b>	5: laws of motion	problem solving with friction, tension, gravity, drag, buoyancy,
<b>9</b>	6: circular motion	lab experiment: centripetal force
<b>10</b>	7: work & energy	work, kinetic energy, work-energy theorem
<b>11</b>	8: potential energy	potential energy, conservation of energy, power
<b>12</b>	9: linear momentum	impulse, momentum, collisions, center of mass
<b>13</b>	10: rigid body rotation	angular velocity, rotational kinematics and energy
<b>14</b>	11: angular momentum	angular momentum, torque, gyroscopes
<b>15</b>	12: angular momentum	lab experiment: rotational kinematics
<b>16</b>	13: statics/elasticity	equilibrium, center of gravity, elasticity
<b>17</b>	14: oscillations	simple harmonic motion, pendulums, forced oscillations
<b>18</b>	15: gravitation	kepler's laws, gravitational potential energy, scattering
<b>19</b>	16: final exams	