Syllabus for PHY 122 Elements of Physics II

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2017 Spring Semester: : MWF 10:00–10:50, S 108

Textbook: "College Physics: Reasoning and Relationships" 2e by Giordano

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PHY 122 Elements of Physics II (3,3)                    Prerequisites:  PHY 121
This is an introductory non-calculus course in Physics designed for students majoring
in disciplines other than math and the physical sciences.  This course covers electric
fields, Ohm's Law, magnetism, light, lenses, and some 20th century physics.
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1 Goals and Outcomes

1.1 Departmental Goals: To Provide Useful Knowledge, Skills, and Perspective

Through the class discussion and lecture, you will be exposed to *the principles and foundations of classical physics* at a level that *introduces* new material. **However, hearing information – even if it** *sounds reasonable* **– does not equate to understanding relationships or techniques.** Solving the homework problems, on the other hand, *will* help you to incorporate these physics principles into your general understanding of the physical world around you. Through this course, you will be trained in a variety of *problem solving techniques and skills* at an *introductory* level. The skills learned in this course will be *reinforced* in the second term.

1.2 Goals of the Instructor: To Provide Training to Think Like a Physicist

Using the three pillars of this course (**Motion**, **Force**, and **Energy**) will enable you to think about new topics in the manner of a professional physicist. Because of this, I consider the primary goal of this class as training for how to critically analyze the physical world around you. These three concepts are both *fundamental* and *powerful*, because they capture the essence of the discipline and enable one to understand previously unrecognized relationships.

1.3 Impact of Goals on Expectations

Your grades on the homework and exams will reflect your knowledge of the principles and foundations, your ability to express these mathematically, your ability to describe them in English, and your ability to reason through new situations. The point of turning in work is to show me how well you understand the material – **include your misunderstandings** so that I can adjust the way I teach to you as individuals. The point of grading work is to show you both how well you understand and how well you communicate that understanding in comparison (through my judgement and experience) to typical students at this same level of experience. Please review returned homework and exams to better learn what you didn't understand. I encourage your to compare your returned work to the posted solutions or to come ask me clarifying questions.

1.4 Student Learning Outcomes

The content of this course will be used as a platform to teach you how to self-assess your understanding and how to ask appropriate questions with the goal of developing your understanding. After successfully completing this course, students should be able to

1. use the fundamental and powerful concepts of motion, force, and energy to understand new topics
2. identify relevant and significant information in a physics textbook
3. use the fundamental and powerful concepts of motion, force, and energy to explain new concepts
4. interpret equations and variables for appropriate use in word problems
5. solve quantitative descriptions of physical situations.

1.5 TMC Quality Enhancement Plan

In 2010, faculty and staff at Thomas More College introduced a Quality Enhancement Plan (QEP) specifically geared to help students in our courses develop, refine, and use critical thinking skills. In this program, modifications were made to courses across the College to introduce students to how critical thinking is accomplished in each area of academic study (e.g. history, philosophy, chemistry, psychology, etc.). By learning how professionals in different areas of study use critical thinking, it is our hope that you can draw on critical thinking practices from a variety of disciplines as you encounter problems and challenges in both your life and respective area of study in the future. This course is one in a collection of courses at Thomas More that have been modified to explicitly include critical thinking terminology and activities. During your time at Thomas More, I encourage you to pay attention to similarities in courses that are participating in the QEP. More information about the QEP can be found at: http://www.thomasmore.edu/3D.

2 Grading

15% **Homework:** Homework will be assigned for each lecture. The "Assigned" problems will be turned in on the day of the lecture and 1 point given for every problem completed, independent of correctness. The point of these is to prepare the students for asking questions during class in preparation for the daily quiz. The "Due" problems will be turned in after the chapter has been discussed and 5-10 points will be awarded as a measure of the correctness of the work. The point of these problems is to prepare the students for solving complex exam questions. Homework makes up 15% of your grade. There will be worked out problems posted to the MyTMC class web-site to help you figure out the assigned problems.

Extra Credit: Extra Credit will be granted to those who find mistakes in the book, lecture, and/or homework solutions. You must write up and hand in a brief explanation of *what* is wrong, *why you think* it is wrong, and what it *should* say.

20% **Exams:** There will be three tests during the semester. Each test is worth 20% of your grade (total 60%). The exams
20% will be primarily word problems with algebraic solutions (very modified homework problems). There will also be a
20% few questions which are conceptual (short answer, multiple choice, or true/false) rather than algebraic.

+25% **Final Exam:** The final exam is comprehensive and is worth 25%. The final will be the same format as the other tests; but, due to the wide variety of topics, you will be given choices on which questions you decide to answer.

100% **Grades:** Final grades will be reported as a percentage of the total earned points weighted by the percentages above. If at any time during the semester you are curious about your grade, I have an Excel worksheet which can printout a summary of your individual grades. Expect the grading scale to be 90-80-70-60, although I reserve the right to adjust this slightly. I consider a score of 75% (mid-C) to be average.

Grade adjustments: You may notice that the schedule has four exams. It is likely that we will be behind schedule at the end of the term and the weighting above reflects that. If we stay on the proposed schedule, then there will be four exams, each worth 15%. If we stay close to the proposed schedule, but do not have a fourth exam, then we might have two or three quizzes after the third exam. In that case, the final exam will be worth 20%, the homework will be 10% and the quizzes will be 10% of the grade.

In any case, the exams will be 60% of your grade. The homework is your chance to practice for the exams; it is worth less so that mistakes there do not hurt you too badly (as long as you are not *consistently* struggling). The final exam is cumulative and an important portion of your grade.

Expectations: Grades are tied to numerical scores according to the following criterion. I consider a mid-C to be average for the typical non-physics science majors.

"A"	Outstanding	> 90
"B"	Above Average	80-90
"C"	Average	70-80
"D"	Below Average	60-70
"F"	Did not successfully complete requirements	< 60

"+" is the upper half of the range.

If you find yourself saying, "Oh... That's good enough..." then you are likely headed for a C.

3 Policies

Just as sports, music, carpentry, and any other skill requires practice, to do well in physics requires practice – Expect to spend time on this class. If you feel you are spending too much time on it, please come to office hours and ask for suggestions. Please, bear in mind that the sooner you ask, the more benefit you will get.

Attendance: Physical attendance is officially mandatory. Mental attendance is appreciated (not to mention helpful). If "something comes up," contact me (note, email, or voice mail) **beforehand**. If you cannot contact me, then tell a friend to contact me that same day. My contact information is at the top of the page.

Athletics: It is your personal responsibility to inform me if you will miss class **before** you miss class. Even if you think an email is being sent on your behalf, see me before or after class so that I can let you know of any variations from the syllabus. If your sport requires you to have a grade report filled out during the semester, I consider it your personal responsibility to inform me that you are going to bring the grade updates before you bring them so that I can have a grade available. Please reread **Attendance** and **Missed Exams**.

Late Policy: No credit will be given for any homework worked in class regardless of who is actually in attendance that day. Homework assignments which are turned in late lose 5 points per day (per *day* not per class-day – Sa and Su together count as a single day).

Missed Exams: Make up exams **must** be scheduled before regular exam time. Documented, unforeseen events will be dealt with on a case-by-case basis.

Office Hour Policy My office hours are posted on my schedule located on my office door. I prefer that you visit during office hours, but I am in my office most days from about 8:00am to about 4:30pm. You are welcome to stop by whenever you have a question. Be aware that my posted schedule also lists times which I will *probably* be in my office. If you call ahead and I am busy, we can find a time that suits us both. Be aware that in the unlikely event we cannot match our schedules, there is a tutor center available.

Disability Services: In compliance with Thomas More College policy and legislation requiring equal access, appropriate accommodations for students with disabilities are available. If you have a documented physical or learning disability for which you require special accommodations, please see John Hennessey, Coordinator for Academic Student Support Services, Administration Building, Mezzanine, (859) 344-3507, as soon as possible. This includes students who have previously received accommodations at TMC.

The Department of Mathematics and Physics has a math and physics tutor center. Mrs. Amy Wendt (344-3348) is the tutor coordinator. She can help you find a time when you can get tutoring for this class. The tutor center is located on the second floor of the Science Wing of the academic building at Thomas More College.

Course Catalogs on the web: http://www.thomasmore.edu/registrar/coursecatalogs.cfm

4 Schedule

The following schedule lists concepts you should be familiar with when you walk into class on the given day. You will also be provided homework problems from these sections. "Assigned" problems from that section should be attempted by that day. "Due" problems will be collected on the subsequent boxed-day.

$*$ - 3/17: Last day to drop with "WP" and † - 3/13: Midterm Reports.

Week	Day	Topic: Know these topics before class	Pre-class Readings
1/9	M	1. **New Semester**: Final Exam, Syllabus, New Expectations	
[Uncertainty Wksht]	W	2. **Hydrostatics**: Pressure, Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Density, ρgh, How does a Barometer work?, Pascal's Principle, Buoyancy and Archimedes' Principle (Fig. 10.19)	10.1-4
	F	3. **Hydrodynamics**: Continuity equation, Bernoulli's equation, Fig. 10.25	10.5
1/16	M	========= **MLKjr Day - No Class** =========	
[senior testing]	W	4. **Oscillations**: Simple Harmonic Motion (Eqn. 11.2); Frequency of a spring (Eqn. 11.14), of a pendulum (Eqn 11.18), and of a torsional pendulum (Eqn 11.20); Hooke's Law (Eqn. 11.22, 6.23), spring constant and the modulus	11.1-2
	F	5. **Chap 11**: Questions about Chapter 11, How does an Atomic Force Microscope work? (Fig 11.33)	
1/23	M	6. **Wave Properties**: Eqn 12.8, Wave Speed (Eqns 12.2, 12.9, 12.10) and direction (Eqns 12.6-7)	12.1-3
[Buoyancy Archimedes]	W	7. **Standing Waves**: Superposition, Reflection, Fig. 12.24	12.5-8
	F	8. **Sound**: Standing sound waves, Figs. 13.5-7, Speed of Sound	13.1-3
1/30	M	9. **Doppler Shift**: Eqn. 13.22, Fig. 13.19	13.4-6
[standing waves]	W	10. **Temperature vs Heat**: Celsius, Fahrenheit, Kelvin; Absolute Temperature; Absolute Zero; Heat Capacity, Examples 14.2,4,5; Phase Diagram Fig. 14.14	14.1-4
	F	11. **Heat as a flow of energy**: Specific Heat Capacity, Latent Heat, Examples 14.2,4,5	14.1-4
2/6	M	12. ⇒ **Test 1** ⇐	⇒ 10–13 ⇐
[speed of sound]	W	13. **Thermal Expansion; Heat Flow**: Eqn. 14.9; Distinguish conduction, convection, and radiation	14.5-8
	F	14. **Gas Laws**: Boyle's Law, Charles' Law, Gay-Lussac's Law, Ideal Gas Law; Isothermal, Isobaric, Isochoric	15.1-2
2/13	M	15. **1st Law of Thermodynamics**: $\Delta U = Q + W$ (Signs of Q and W pg. 510-11); Isobaric (Fig 16.12), Isothermal (Fig 16.14), Adiabatic (Fig 16.15), Isochoric (Fig 16.16)	16.1-4
[Thermal Expansion]	W	16. **1st Law of Thermodynamics**: $\Delta U = Q + W$ (Signs of Q and W pg. 510-11); Isobaric (Fig 16.12), Isothermal (Fig 16.14), Adiabatic (Fig 16.15), Isochoric (Fig 16.16)	16.1-4
	F	17. **2nd Law of Thermodynamics**: Fig 16.26, Perpetual Motion, Carnot (Fig 16.31), Entropy (Eqn 16.29)	16.5-7
2/20	M	18. **3rd Law of Thermodynamics**: and questions about Chap 16	16.8
[specific heat]	W	19. **Electrical Charge, Electric Force**: Quantized, Conservation of Charge, Coulomb's Law, vectors (Fig 17.7)	17.1-2

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Week	Day	Topic: Know these topics before class	Pre-class Readings
	F	20. **Electric Field**: Figs 17.12,16,17; Insulators, Induction, "Ground"	17.3-4
2/27	M	21. ⇒ **Test 2** ⇐	⇒ 14–16 ⇐
[E-field lines]	W	22. **Gauss' Law**: Eqn 17.12 and Fig 17.27	17.5
	F	23. **Electrical Potential Energy**: Eqns 18.4,6; Example 18.3; Electric Potential (Eqn 18.10,18), Potential Difference, Equipotential Lines (Fig 18.17, and Figs 18.18 vs 17.12b)	18.1-3
3/6	M-F	========== **Spring Break** ==========	
3/13	M	24. **Capacitance**: Eqn 18.30, Eqn 18.31, Capacitors in Series & Parallel (Eqns 18.41-42)	18.4
[Int.R of Batt.]	W	25. **Electric Current and Voltage**: Ideal and Real Batteries, Ohm's Law (Eqn 19.10), Resistivity (Eqn 19.11), Symbols (Table 19.2), Ammeters and Voltmeters	19.1-3,6
	F	26. **DC Circuits**: Resistors in Series & Parallel (Eqns 19.18,25), Kirchhoff's Rules (pg 640), Internal Resistance of Real Batteries	19.4
3/20	M	27. **DC Circuits**: Resistors and Capacitors (RC Circuits), Eqns 19.28,29,30,31	19.5
[Ohm's Law]	W	28. **Magnetic Fields**: Magnets, Field Lines (Figs 20.1-9), "right-hand rule" (Figs 20.5,9)	20.1-2
	F	29. **Magnetic Force and Torque**: Eqn 20.1 and 20.12, Fig 20.16,20,22; Eqn 20.14, Figs 20.24-26	20.3-5
3/27	M	30. ⇒ **Test 3** ⇐	⇒ 17–19 ⇐
[RC Circuits]	W	31. **Size and Effect of Magnetic Fields**: How does a mass spectrometer work?, Eqns20.17,19,20,24	20.6-7
	F	32. **Induction, Faraday, and Lenz**: Electromagnetism, magnetic induction, magnetic flux (Eqn 21.2, Fig 21.8), Generators (Fig 21.7), GFI (pg 737)	21.1-3
4/3	M	33. **Induction, RL Circuits**: Eqns 21.26, 21.27, 21.28	21.3-5
[Magnetic Fields]	W	34. **Electromagnetic Radiation**: Properties, the spectrum, radio	23.2,4,5
	F	35. **Optics**: Reflection and Refraction, incident angle, Snell's Law	24.1-3
4/10	M	36. **Lenses**: Simple lens, ray tracing, converging, diverging	24.5
[Reflection Refraction]	W	37. **Lenses**: Simple lens, ray tracing, converging, diverging	24.5
	F	========== **Easter Break** ==========	
4/17	M	========== **Easter Break** ==========	
[No Lab]	W	38. **AC vs DC**: AC Resistors	22.1-2
	F	39. **AC circuits**: AC Capacitors and Inductors	22.3-4
4/24	M	40. ⇒ **Test 4** ⇐	⇒ 20-21, 23-24 ⇐
[Simple Lens]	W	41. Review for Final	
	F	42. Review for Final	
5/4	Th	43. **Final exam**: 8:30–10:30	all
[Make-up Lab week]			