PH2400 Waves and Modern Physics Summer 2018 – Track B

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Materials

1. Required Text: Modern Physics, 3rd Ed, by Serway, Moses, and Moyer. ISBN 9780534493394
2. High speed internet sufficient for streaming video, accessing course materials, etc. Most students will want access every weekday. Some course simulations use Java and Flash.

Course Overview

In PH2400, we will explore wave-particle duality, atomic models and spectroscopy, solutions to Schrodinger's equation in 1 and 3 dimensions, nuclear structure and decay, and special relativity. Differential and integral calculus is required.

Vital Course Information

1. **Time Commitment:** This summer course is very intense – we cover a semester's worth of physics in only 7 weeks. Expect to spend around 20 hours per week on this course. Many students find it takes even more time during more difficult material.
2. **Ask for help when you need it:** In an online course, it's up to you to seek help when you need it. I can't see if you look confused! It's my job to help you learn this material, so please don't hesitate to be in touch with me and your classmates early and often. Make use of our class forum on Piazza!
3. **Not Entirely Self-Paced:** The course material is divided into three units, each culminating with an exam. You may work within each unit at a faster pace than suggested, but assignments must be completed by their due dates and exams must be taken on the scheduled days. New units will open the Wednesday before the first assignments are due.
4. **Exams Must Be Proctored:** All course components EXCEPT exams are made available and submitted online via Canvas, Michigan Tech's learning management system. If you are not able to take exams at the Michigan Tech campus, you must arrange for an objective and disinterested proctor. Details are available on Canvas and at http://www.mtu.edu/ctl/testing-center/proctors/

Grading Policy

Your final grade will be determined using the following weights:

Reading Quizzes	5%
Video Quizzes	10%
Written Homework	30%
Reflect	5%
Midterms	30% (15% each)
Final Exam	20%

Letter grades will be assigned as follows:

A	100-90%
AB	85-89%
B	80-84%
BC	75-79%
C	70-74%
CD	65-69%
D	55-64%
F	F 0-54%

I reserve the right to adjust these ranges downward, but will not adjust them upward.

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Course Components and Work Schedule

The course components are designed to help scaffold your learning, which is especially important in an online course. **Each day** introduces a new topic. For each daily topic, there are several components to complete.

Reading: For each topic, related sections of the text are assigned. Read these sections, then take the…

Reading Quiz: The reading quiz on Canvas is a check that you have a basic understanding of the daily topic. Reading quizzes have a time limit of 30 minutes, and you only have one attempt. After you take the reading quiz, do the…

Videos and Online Activities: There will be one or more short videos or activities on Canvas for each textbook section. These can emphasize important points from the text, show techniques for problem solving, or help develop your conceptual understanding and intuition. Watch the videos or do the activities, then take the…

Video Quiz: The video quiz on Canvas is a check that you understood the material in the video/activity, and gives you practice in the ideas you will use in the homework. If you have trouble with the quiz, you will want to review the material and try again - you have unlimited tries to get these questions right!

Reflect on your learning: Over the course of the class, I expect each student to make 30 posts (one for each topic) to our class forum. These posts can be answering the *Reflect* prompt for each topic, asking a question about course material, or answering a question about course material. Your posts to the forum can appear anonymously to your classmates if you choose.

Each week, there will be a written homework assignment related to the daily topics from that week. You will need to submit a PDF of your solutions to Canvas by Sunday at 11:59 pm, which allows for weekend time to finish the homework if needed.

Exams

This course has two midterms and one final exam. The scheduled dates are:

Midterm 1: Wednesday, July 18 (Chapters 3-5)
Midterm 2: Wednesday, August 1 (Chapters 6-8)
Final Exam: Friday, August 17 (Comprehensive with emphasis on Ch. 1, 2, 13, 14)

Exams are open book (that is, your physical text; not an e-text) and open notes (physical notes on paper) and must take place under the supervision of a proctor. Using the internet or any electronically stored notes is not allowed. Local students will take exams at Michigan Tech's testing center. Those who are off-campus will need to arrange their own local proctors. Exams will take place **between 7:00 AM and 9:00 PM local time on the dates listed above. Be sure that your proctor is available during this interval.**

Academic Integrity

I have a liberal policy toward students working together to solve homework problems. Just as physicists work together to do physics, physics students should work together to understand homework problems! You can work together in person, or ask and answer questions in our class forum, Piazza. HOWEVER, do not short-change yourself by using another student's work to answer quizzes and homework questions. Not only is this a breach of academic integrity, but doing homework is like practicing for a recital or training for a marathon. You may find a way to cut corners, but your exam grades will show it!

Of course, during an individual examination, any communication with any other person, or use of any clandestine notes is considered cheating. If academic dishonesty is suspected, the matter will be referred to the Office of Student Affairs. The penalty is no less than an academic integrity warning and no more than expulsion.

University Policies

This course adheres to University policies regarding academic integrity, use of student work for university, program, or course assessment, disability accommodation, institutional equity, veteran and military accommodation, and equal opportunity, discrimination, or harassment. Updated policy statements can be found at http://www.mtu.edu/ctl/instructional-resources/syllabus/syllabus_policies.html.

If you require disability accommodation for any reason, please don't hesitate to contact me or the Dean of Students for guidance. Distance students should be aware that according to Michigan Tech University guidelines, disability accommodations are verified through the Dean of Students at http://www.mtu.edu/deanofstudents/disability/

PH2400 Class Schedule - Summer 2018

Week	Day	Date	Reading	Topic
1	1.1	2-Jul	Posted on Canvas	Review of oscillators and waves
	1.2	3-Jul	3.1	Diffraction and superposition, wave-like nature of light
	1.3	4-Jul		*Independence Day Recess*
	1.4	5-Jul	3.2, 3.4	Blackbody radiation and photoelectric effect
	1.5	6-Jul	3.5-3.6	Compton effect and review of wave-particle duality
2	2.1	9-Jul	4.1-4.2	History of Atomic Models
	2.2	10-Jul	4.3	Bohr Model and Spectroscopy
	2.3	11-Jul	5.1-5.2	Wave-like nature of matter, deBroglie wavelength
	2.4	12-Jul	5.3-5.4	Wave packets and Heisenburg Uncertainty Principle
	2.5	13-Jul	5.6-5.8	Two-slit electron diffraction
3	3.1	16-Jul	6.1-6.2	Born interpretation of wave function
	3.2	17-Jul	6.3	Graphical analysis of Schrödinger Eq. for finite square well
	3.3	18-Jul		**Midterm Exam 1: Chapters 3, 4, and 5**
	3.4	19-Jul	6.3-6.5	Mathematical analysis of finite and infinite square well
	3.5	20-Jul	6.6	Quantum oscillators
4	4.1	23-Jul	6.7 - 6.8	Expectation values and operators
	4.2	24-Jul	STM Essay (pg 253)	Graphical analysis of Schrödinger Eq. for tunneling
	4.3	25-Jul	7.1	Mathematical analysis for tunneling
	4.4	26-Jul	8.1-8.4	3-D Square well, quantum numbers
	4.5	27-Jul	8.5	Hydrogen atom
5	5.1	30-Jul	9.1-9.2	Zeeman effect and electron spin
	5.2	31-Jul	9.3, 9.4, 9.6	Pauli exclusion principle and perodic table
	5.3	1-Aug		**Midterm Exam 2: Chapters 6, 7, and 8**
	5.4	2-Aug	13.1-13.3	Nuclear Structure
	5.5	3-Aug	13.4-13.6	Radioactivity and Decay
6	6.1	6-Aug	14.1, 14.4	Nuclear Fission
	6.2	7-Aug	1.1-1.4	Need for and development of special relativity
	6.3	8-Aug	1.5	Relativity of Simultaneity
	6.4	9-Aug	1.5	Time dilation and length contraction
	6.5	10-Aug	1.6-1.7	Lorentz transforms and spacetime
7	7.1	13-Aug	2.1-2.4	Relativistic energy and momentum
	7.2	14-Aug	2.5	Ideas of general relativity and gravitational waves
	7.3	15-Aug		Study Day
	7.4	16-Aug		Study Day
	7.5	17-Aug		**Final Exam**