

COURSE AND INSTRUCTOR INFORMATION

Course: PHY 240 (Introduction to Modern Physics)

Lecture Location: **Merion 112**

Lecture Time: MWF: 2:00 pm – 2:50 pm

Instructor: Anil K. Kandalam (Dr. Kandalam or Dr. K)

Office Location: Schmucker Science South, SSS 403A

Email: akandalam@wcupa.edu

Office Hours: Wednesday: 8:00 am – 9:00 am, Thursday: 9:00 am – 11:00 am

Friday: 10:00 am – 11:00 am and 1:00 pm – 2:00 pm or by appointment

COURSE DESCRIPTION

In this course, we will examine the empirical basis for Modern Physics: special theory of relativity, an atomic view of radiation, atomic theory, introductory quantum mechanics, X-rays, radioactivity, and nuclear fission.

REQUIRED COURSE MATERIALS & INCLUSIVE ACCESS

Textbook: *Modern Physics, Kenneth Krane (3rd Edition).*

An e-text of this book is directly accessible from the course D2L page. This is provided through WCU's Inclusive Access Program. You will have access to the textbook up to 12 months. This means you should see \$62.12 charge for Modern Physics, Kenneth Krane, appear on your Bursar's account. This is a discounted price. Currently, the physical copy of the book costs \$210 (new) and \$145 (used) at the University bookstore.

If you prefer/already have a physical copy of the textbook or Drop the Course: You can opt-out of inclusive access until the drop/add deadline. You should have received an email with a link to do this. If you opt-out before the deadline, you receive a refund.

Questions about Inclusive Access should be directed to: inclusiveaccess@wcupa.edu

EXPECTATIONS

This is a fast pace course. For a successful completion of this course, you are not only expected to come to the class regularly, but also take notes in the class regularly, solve the problems assigned in the class, and read the example problems from the text book. **To keep up with the pace of the course, I strongly suggest you read the sections in the text indicated in the schedule before you get to class.**

COURSE COMPONENTS

Pre-class Reading: You must read the assigned sections from the textbook before coming to the class. Since, we have limited lecture time, we must focus on the more challenging concepts in the course. Thus, it is critical that you come to lecture knowing the basic elements which we will build on in lecture that day. The pre-class reading sections are assigned for each lecture and are given in the ***Course Schedule Table*** of this syllabus.

Lecture: I attempt to make the lecture as informal as possible. I encourage questions during the lecture.

Problem Sets: There will be one problem set almost every week. Generally, they will be given out on Mondays and due the following week's Wednesday in class. A large fraction of the learning in this course takes place working on these homework problems, so it is essential that you put a substantial effort into these assignments. **Late work cannot be accepted except by prior arrangement with the instructor.** Working to deadlines is an aspect of personal responsibility and, as such, it is an important skill to develop. All problem sets will be graded (***to varying degrees***) and returned the following week (typically during Monday class time). If you fail to turn in a problem set because of absences (excused or unexcused) then you will receive a zero for the problem set grade. **The problem sets will be graded only roughly.** It is your responsibility to check your work with the solution set.

EVALUATION

The final grade for this course will be based on the following:

- Reading Quizzes 5%
- Homework Assignments30%
- Exams (3 @ 15% each) 45%
- Final exam..... 20%

Letter grades will be assigned on the following scale. However, I reserve the right to adjust the weights of individual components, or the scale to account for unforeseen circumstances.

93 – 100 %	A	73 – 76 %	C
90 – 92 %	A–	70 – 72 %	C–
87 – 89 %	B+	67 – 69 %	D+
83 – 86 %	B	63 – 66 %	D
80 – 82 %	B–	60 – 62%	D–
77 – 79 %	C+	59% or lower	F

GRADING COMPONENTS AND POLICIES

Reading Quizzes: Reading quizzes will be assigned for most of the lectures. Each reading quiz will consist of 3 to 5 multiple-choice questions. These questions will be based on the pre-class reading sections that are assigned for each lecture (see the course schedule). Each of these quizzes will be assigned the day before they are due. For example, the first reading quiz is based on the sections 2.1 – 2.3 and it is due on January 27th at the beginning of the lecture. **This quiz will be posted on the D2L on January 24th. I will drop the lowest 2 reading quiz grades.**

Problem Sets: As students transitioning out of the introductory physics course sequence, you undoubtedly and keenly know the importance of completing the assigned problems (which should be viewed as a minimum assignment).

Discussions concerning the problems and their solutions are encouraged among the members of the class and between the class and the instructor, but the work that you hand in must be your own and must reflect your own understanding of the material.

Solutions consisting of disembodied equations without expository text are unacceptable. As a guide to the proper elements of a solution, a rubric prepared by Dr. Caler that lists criteria for quality, is given at the end of this document.

The best balance between working alone and working with other people is to (i) Give each problem a good try on your own first. If you get stuck, reread the relevant section of the text and review your notes and

try it again. If you're still stuck, then **(ii)** ask for help from other students and then **(iii)** complete the problem alone where you can collect your thoughts in peace. Make sure that you understand the solution to each problem that you turn in. If step **(ii)** does not help, you can always get hints from me during my office hours. **Please do not ask for help/hints via. e-mail.** Please indicate the names of people you have collaborated with for a problem set.

Here's a handy rule of thumb: if you can do the problem without referring to any notes, then you understand the concept and the problem-solving approach. Try a similar problem and prove it to yourself.

Regular Exams: There are a total of **three** exams that will be given in the semester. **No grades will be dropped and there are no-make up exams.** The exceptions, however, are limited to the absences related to University Sanctioned Events (see below). If you miss an exam for a University Sanctioned Event you must notify me in advance so that we can arrange for you to take the exam in a manner consistent with its integrity. You must also provide some form of documentation (performing arts program, competition schedule etc.). If you miss the exam for any other reason the same rules apply, and it must be a very good reason (sickness, death, and dismemberment qualify).

Final Exam: The final exam is a cumulative exam and is MANDATORY.

CONTACT POLICY: Please include **PHY240** in the subject line of any e-mail. I try to respond to e-mail within 24hrs. Although I will try to answer all questions directed to me by e-mail, most problems related to course content are best discussed during office hours.

ACADEMIC INTEGRITY & CONDUCT

I have a zero-tolerance policy for breaches of academic integrity. Breaches of academic integrity will be investigated, and sanctions imposed to the full extent available under University policy. It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the University website at www.wcupa.edu.

ATTENDANCE POLICY

A regular attendance to the lectures is an important part of this course and I highly recommend it. This is your chance to ask questions, see examples and get help in solving problems. I am here to guide you through the material. However, **I do not give an attendance grade.** Students must understand that they are responsible for all material covered and assigned during their absences (excused and unexcused) and that they are responsible for the academic consequences of their absences.

EXCUSED ABSENCE POLICY

If you are participating in a University sanctioned event during one of our scheduled exams you must notify me in advance. You must provide some form of documentation. We can then arrange for you to

take the exam in a manner consistent with exam integrity. Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the “responsibility for meeting academic requirements rests with the student,” that this policy does not excuse students from completing required academic work, and that professors can require a “fair alternative” to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University’s Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at www.wcupa.edu/ussss/ossd. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University protection of minors policy. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at the webpage for the Office of Diversity, Equity, and Inclusion at <https://www.wcupa.edu/admin/diversityEquityInclusion/aboutUs.aspx>.

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University’s free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

COURSE SCHEDULE

A tentative course content and schedule for this course is given in the next page. ***I reserve the right to adjust this schedule*** as necessary during the semester to ensure a satisfactory learning experience.

	Date		Topic	Reading
1	W	Jan. 22	Ch. 1: Introduction & Review of Classical Physics	1.1 – 1.4
2	F	Jan. 24	Ch. 2: Special Theory of Relativity	2.1 – 2.3
3	M	Jan. 27	Ch. 2: Special Theory of Relativity	2.4
4	W	Jan. 29	Ch. 2: Special Theory of Relativity	2.5 & 2.7
5	F	Jan. 31	Ch. 2: Special Theory of Relativity	2.7 & 2.8
6	M	Feb. 3	Ch. 2: Special Theory of Relativity	2.8 & 2.9
7	W	Feb. 5	Ch. 3: The Particle-like Properties of EM radiation	3.1
8	F	Feb. 7	Ch. 3: The Particle-like Properties of EM radiation	3.3
9	M	Feb. 10	Ch. 3: The Particle-like Properties of EM radiation	3.2, 3.4
10	W	Feb. 12	Ch. 3: The Particle-like Properties of EM radiation	3.4 – 3.6
11	F	Feb. 14	Ch. 4: The Wave-like Properties of Particles	4.1 & 4.2
12	M	Feb. 17	Ch. 4: The Wave-like Properties of Particles	4.3, 4.4
13	W	Feb. 19	Ch. 4: The Wave-like Properties of Particles	4.4, 4.5
	F	Feb. 21	Exam – 1: Chapters 1 – 3	
14	M	Feb. 24	Ch. 4: The Wave-like Properties of Particles	4.6
15	W	Feb. 26	Ch. 4: The Wave-like Properties of Particles	4.7
16	F	Feb. 28	Ch. 5: The Schrodinger Equation	5.1, 5.2
17	M	Mar. 2	Ch. 5: The Schrodinger Equation	5.3
18	W	Mar. 4	Ch. 5: The Schrodinger Equation	5.4
19	F	Mar. 6	Ch. 5: The Schrodinger Equation	5.4
	M	Mar. 9	SPRING BREAK	
	W	Mar. 11		
	F	Mar. 13		
20	M	Mar. 16	Ch. 5: The Schrodinger Equation	5.5, 5.6
21	W	Mar. 18	Ch. 5: The Schrodinger Equation	5.6
22	F	Mar. 20	Ch. 6: The Rutherford-Bohr Model of the Atom	6.1 – 6.3
23	M	Mar. 23	Ch. 6: The Rutherford-Bohr Model of the Atom	6.3, 6.4
24	W	Mar. 25	Ch. 6: The Rutherford-Bohr Model of the Atom	6.5
	F	Mar. 27	Exam – 2: Chapters 4 – 5	
25	M	Mar. 30	Ch. 6: The Rutherford-Bohr Model of the Atom	6.6, 6.8
26	W	Apr. 1	Ch. 7: The Hydrogen Atom in Wave Mechanics	7.1, 7.2
27	F	Apr. 3	Ch. 7: The Hydrogen Atom in Wave Mechanics	7.3
28	M	Apr. 6	Ch. 7: The Hydrogen Atom in Wave Mechanics	7.4
29	W	Apr. 8	Ch. 7: The Hydrogen Atom in Wave Mechanics	7.5, 7.6
30	F	Apr. 10	Ch. 7: The Hydrogen Atom in Wave Mechanics	7.7 – 7.9
31	M	Apr. 13	Ch. 8: Many-Electron Atoms	8.1 – 8.3
	W	Apr. 15	Ch. 8: Many-Electron Atoms	8.3 – 8.5
32	F	Apr. 17	Ch. 8: Many-Electron Atoms	8.6 – 8.7
	M	Apr. 20	Exam – 3: Chapters 6 – 8	
33	W	Apr. 22	Ch. 12: Nuclear Structure and Radioactivity	12.1 – 12.4
34	F	Apr. 24	Ch. 12: Nuclear Structure and Radioactivity	12.5 – 12.7
35	M	Apr. 27	Ch. 12: Nuclear Structure and Radioactivity	12.7 – 12.10
36	W	Apr. 29	Ch. 13: Nuclear Reactions and Applications	13.1 – 13.3
37	F	May 1	Ch. 13: Nuclear Reactions and Applications	13.4, 13.5
38	M	May 4	Ch. 13: Nuclear Reactions and Applications	13.6, 13.7
FINAL EXAM: FRIDAY, MAY 8, 2020 (3:30 PM – 5:30 PM)				

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

ALL OTHER ACADEMIC POLICIES

For any university-wide academic policy not explicitly covered in this document, such NO Grade policies, please consult your major advising handbook, the Undergraduate Catalog, the Ram's Eye View, or University Website.

HOMEWORK GRADING RUBRIC*

The below criteria apply to problems seeking a numerical answer as well as those that require a proof or an illustration.

Grading Criteria	Point Value¹
• The problem is properly set up • Your methodology is clear and it is correct • Expository text guides the reader through the problem • Your math is correct, or contains a minor algebraic error • The result is correct, or contains a minor algebraic error • All collaborators are cited	5 points
• The problem is properly set up • Your methodology is clear, but it contains a major error • Expository text guides the reader through the problem • Your math is consistent with your methodology error, or has a minor algebraic problem • The result is not correct • All collaborators are cited	4 points
• The problem is properly set up • Your methodology is not clear, but it seems to be correct • No expository text exists • Your math seems to be correct, or seems to contain a minor algebraic error • The result is correct, or contains a minor algebraic error • No collaborators are cited	3 points
• The problem is properly set up • Your methodology is clear, but contains more than one major error • Expository text guides the reader through the problem • You have several math errors • The result is not correct • All collaborators are cited	2 points
• You made an attempt to set the problem up • Your methodology is not clear, and it appears to contain at least one major error • No expository text exists • You have several math errors, or your math ends abruptly • The result is incorrect or unclear • No collaborators are cited	1 point
• You have not done the problem, or what you have submitted is meaningless or indecipherable²	0 points

1: If the problem is a multiple-part problem, the above grading criteria will be applied to each individual part; however, the point values will be scaled accordingly. If the problem in the assignment is worth more than 5 points, then the above grading rubric will be scaled accordingly.

2: Work that cannot be *easily* read will not be graded.

**Adapted from Dr. Caler's PHY 300 course syllabus.*