

# PHYSICS 300: CLASSICAL MECHANICS

WEST CHESTER UNIVERSITY  
FALL 2018



## SYLLABUS

UPDATED: August 11, 2018

### INSTRUCTOR

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### OFFICE HOURS

| Day      | Time                         |
|----------|------------------------------|
| Monday   | 10:00–10:50 am, 3:00–4:30 pm |
| Thursday | 1:00–2:50 pm                 |
| Friday   | 10:00–10:50 am               |

### COURSE DETAILS

|             | Day                       | Time              | Location   |
|-------------|---------------------------|-------------------|------------|
| Class:      | Monday, Wednesday, Friday | 11:00 am–11:50 am | Merion 109 |
| Final exam: | Friday, December 14       | 10:30 am–12:30 pm | Merion 109 |

### COURSE DESCRIPTION

*PHY300: Mechanics* is an intermediate course in classical mechanics intended for physics majors. Physics topics include Newton's laws, conserved quantities, oscillations, Lagrangian mechanics, central forces, and rigid rotation. Math topics include ordinary linear differential equations, vector calculus, complex exponentials, variational methods, and the use of curvilinear coordinates.

### PRE- AND CO-REQUISITES

Satisfactory completion of MAT 162 (Calculus II), as well as PHY140 (General Physics II) or PHY180 (Physics II), is required to enroll in this course. I strongly recommend that students who have not yet completed MAT 261 (Calculus III) take this course concurrently.

### TIME COMMITMENT

PHY300 is a 3-credit hour course presented at the intermediate (junior/senior) level. As such, this course requires 3-9 hours of reading, assignments, and studying outside of scheduled class time each week.

## STUDENT LEARNING OUTCOMES

This course contributes to the following Physics Department student learning outcomes:

- **Knowledge and understanding of the concepts and principles of physics (Outcome A).** Upon successful completion this course, students will demonstrate competence solving problems involving the topics listed in the [Course description](#).

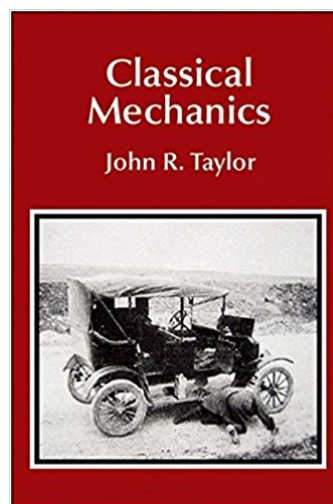
Course material is introduced through lecture and textbook reading. Weekly homework assignments provide students with training and practice. Student competence is primarily assessed through in-class exams and the final exam.

- **Effective Communication (Outcome C).** Upon successful completion of this course, students will demonstrate the ability to formulate complete written solutions to classical mechanics problems.

Weekly homework assignments serve as both a practice and assessment tool for this outcome. Early in the semester, communication will not be a graded item. Students will receive feedback and guidance on their communication skills. As the semester progresses, effective communication will become an increasingly important graded item.

## COURSE MATERIALS

1. **TEXTBOOK:** The course textbook is *Classical Mechanics*, by John R. Taylor (University Science Books, 2005. ISBN: 9781891389221). You are expected to have access to this text. New versions of the textbook are for sale at the [WCU campus store](#); you will find less expensive options elsewhere. You do not need to bring the textbook to class.
2. **CALCULATOR:** For in-class exams and the final exam you will need a stand-alone calculator with no internet or communication abilities. You will want a calculator that can solve the quadratic formula, compute (hyper)trigonometric functions and powers, and operate in scientific notation. You may not use a watch, mobile phone, or computer.



## ASSESSMENT

This course follows the official WCU scale for grades:

| Grade | Quality Points | Percentage | Interpretation |
|-------|----------------|------------|----------------|
| A     | 4.00           | 93–100     | Excellent      |
| A–    | 3.67           | 90–92      |                |
| B+    | 3.33           | 87–89      | Superior       |
| B     | 3.00           | 83–86      |                |
| B–    | 2.67           | 80–82      |                |
| C+    | 2.33           | 77–79      | Average        |
| C     | 2.00           | 73–76      |                |
| C–    | 1.67           | 70–72      |                |
| D+    | 1.33           | 67–69      | Below Average  |
| D     | 1.00           | 63–66      |                |
| D–    | 0.67           | 60–62      |                |
| F     | 0.00           | <60        | Failure        |

Refer to the [WCU Undergraduate Catalog](#) for description of NG (No Grade), W, Z, and other grades.

Elements of the course will contribute to the course grade as follows:

| Percent | Category                             |
|---------|--------------------------------------|
| 15%     | Homework                             |
| 60%     | Exams (highest 3 scores at 20% each) |
| 25%     | Final exam                           |

**15% HOMEWORK:** Weekly homework assignments are posted on [D2L](#) and are due **at the start of class** on the date listed on the assignment. In general, homework is due on Fridays; if there is an exam on Friday, then homework is due the proceeding Wednesday. Assignment due dates are listed on the [Course Schedule](#).

Homework is assessed for both completeness and accuracy. Homework may be “spot checked”, i.e., not all aspects of an assignment may be examined. Homework should be prepared following the [Homework guidelines](#) below.

Solutions to homework problems are posted on [D2L](#) after the assignment deadline. See [Policies on late or missed work](#) below.

**60% EXAMS:** There will be 4 in-class exams administered during the semester. The tentative exam dates are listed on the [Course Schedule](#). Exams are not offered at alternate times, unless an exam conflicts with an event which is recognized by the WCU [Excused Absences Policy](#). See the [University-Sanctioned Events](#) policy below.

Each exam focuses on material covered in the previous 3-4 weeks of class. However, exams may be regarded as cumulative since the course material builds upon itself.

Exam scores may be scaled (“curved”) to conform to a standard distribution of grades. Failure to take an exam results in a 0 score.

**When calculating your course grade, I will “drop” your lowest exam score.**

25% **FINAL EXAM:** The comprehensive final exam is scheduled for the time listed on page 1. The final exam time and date are arranged by the Registrar’s Office and can change. You should plan to be available the entire Final Exam Period (December 11-15, 2018).

Final exam scores may be scaled (“curved”) to conform to a standard distribution of grades. Failure to take the exam results in a 0 score.

Feedback and scores for homework and exams are provided on the documents themselves, which are returned about a week after they are submitted. Scores for homework and exams are posted on the [D2L](#) grade book.

Although unlikely, I reserve the right to alter the assessment scheme in order to accommodate for unforeseen circumstances or to better serve the learning objectives of the course. Due dates of homework as well as the dates of exams may change.

## ACCOMMODATION

If you require additional accommodation for any aspect of the course you must notify me in advance so that we can make arrangements. Depending on the accommodation, you may need to provide documentation.

- **OSSD:** If you have an ongoing medical condition which effects your ability to meet the course expectations then you should register with the [Office of Services for Students with Disabilities](#) (OSSD). **To receive accommodation you must submit your OSSD letter via D2L** (path: Assessments>Assignments>OSSD letters of accommodation).
- **ACUTE MEDICAL CONDITIONS:** If you have an acute medical condition which causes you to miss at least three consecutive school days then you may seek accommodation from the [Office of the Assistant Dean of Students](#).
- **PERSONAL EMERGENCIES:** Rarely, a personal emergency can arise which prevents a student from meeting course expectations. In such a rare circumstance I am happy to work with the student in order to make appropriate arrangements. I require documentation which verifies the emergency. If desired, the [Office of the Assistant Dean of Students](#) can act as a liaison and provide confidential verification of the emergency.

## UNIVERSITY-SANCTIONED EVENTS

If you are unable to perform an aspect of the course due to a University-Sanctioned Event you must notify me in advance so that we can make arrangements. **Official documentation verifying your participation in the event must be submitted via D2L** (path: Assessments>Assignments>Absence letters for University-Sanctioned Events).

## POLICIES ON LATE OR MISSED WORK

If you suspect that you will not be able to meet a course deadline you should notify me in advance so that we can discuss possible resolutions. The default policies on late and missed work are as follows:

- **HOMEWORK:** I collect homework at the start of class. Late work must be submitted directly to me **in person**, and may not be considered. No work is accepted after solutions are posted on [D2L](#).
- **EXAMS:** Exams are not offered at alternate times, unless an exam conflicts with an event which is recognized by the WCU [Excused Absences Policy](#). See the [University-Sanctioned Events](#) policy above. Failure to take an in-class exam results in a 0 score.
- **FINAL EXAM:** The final exam time, date, and location are arranged by the Registrar and are beyond my control. The final exam is not offered at alternate times, unless the exam conflicts with an event which is recognized by the WCU [Excused Absences Policy](#). See the [University-Sanctioned Events](#) policy above. Failure to take the final exam results in a 0 score.

## ATTENDANCE POLICY

I expect you to attend all class meetings on time and ready to participate and learn. Obviously, if you are sick or unwell then you should not attend class. Federal law requires that I periodically take attendance. Students who have poor attendance (e.g., miss more than 6 classes) will be reported as having poor attendance. Students who fail the course while having poor attendance may receive a “Z” grade. See the WCU [Title IV Federal Financial Aid Compliance Policy](#).

If you miss a class it is your responsibility to make up the missed learning opportunity by reviewing the text and other course materials. You are welcome to seek assistance in office hours, but I cannot reproduce an entire lecture outside of class. Missing class does not excuse you from completing other aspects of the course on time.

Your attendance is excused for conflicts recognized by the WCU [Excused Absences Policy](#). See the [University-Sanctioned Events](#) policy above.

## ELECTRONIC DEVICE POLICY

**The only personal electronic devices that may be used in class are tablet-style computers which use a stylus.** Other electronic devices such as mobile phones, smart watches, ipods, and laptop computers are not conducive to the kind of note-taking necessary for this course. Their use distracts the user and students around them. It's fine if you have these devices with you, but they must remain out of sight. If I see or hear these devices then I will ask you to leave the class.

## ADDITIONAL RESOURCES

There are many good textbooks on classical mechanics. You may find the following useful:

- *Introduction to Classical Mechanics, with Problems and Solutions*, by David Morin: This textbook is at a slightly lower level than our course, and much of the emphasis is rather different. However, it includes many solved examples, and very clever problems.
- *Mathematical Methods in the Physical Sciences*, by Mary L. Boas: This is an excellent reference for the math methods employed in upper level physics courses. If you want more exposition on the math methods used in this course then this where you should look. This textbook is frequently used in PHY 370.
- *Classical Dynamics of Particles and Systems*, by Stephen T. Thornton and Jerry B. Marion. This is a slightly more advanced undergraduate textbook on classical mechanics. It is more mathematically rigorous and exhaustive in its coverage. However, I think this textbook has too much detail and not enough insight.

Also, you may find it useful to “brush up” on subjects by reviewing them in an introductory level textbook, such as *Fundamentals of Physics* by Halliday, Resnick, and Walker (the PHY170-180 textbook).

## D2L, EMAIL, AND ALL THAT

- **COURSE PLATFORM:** All course documents are maintained on the course [D2L](#) site. I use the [D2L](#) announcement tool to make class-wide announcements. You are responsible for regularly checking the course [D2L](#) site. I may not announce in class changes to course content on [D2L](#). As with all technology, [D2L](#) can have glitches and service outages. For this reason, check [D2L](#) frequently and do not leave tasks to the last minute.
- **EMAIL:** I use email for individual correspondence and for time-sensitive class-wide communications. Except in the event of a technical failure or an emergency, I will only use university email (mine and yours) to correspond.
- **COMMUNICATION:** All electronic communication should be written with appropriate language and etiquette.

- **DISCUSSING GRADES:** Due to limitations set by federal law (FERPA), I will not discuss grades over email. I am happy to discuss your progress in the course in person during office hours or by appointment.

## ACADEMIC INTEGRITY

Students are expected to follow all WCU rules and guidelines on academic integrity as described in the [WCU Undergraduate Catalog](#). Here are a few relevant issues for this class:

- **ONLINE PLATFORM:** [D2L](#) is an extension of the classroom and as such all WCU rules regarding student behavior apply on these platforms. Do not violate the copyrights of these sources or misrepresent your identity on [D2L](#).
- **COLLABORATION:** Students are encouraged to study together and collaborate on assignments. However, you should go through the process of solving each homework problem yourself. Please list collaborators on your homework. Submitting solutions which you have not yourself obtained is fraud.
- **ONLINE RESOURCES:** Students are welcome to use online resources to help them complete assignments. Please list any reference you use (aside from course materials) on your homework. However, “resources” does not include specific solutions to assigned problems, whether found online or elsewhere. **Submitting solutions which you have not yourself obtained is fraud.**

Students who violate WCU rules of academic integrity will receive a failing grade (F) in the course and an [Academic Integrity Violation Report](#). These actions will adversely affect your academic career and could result in expulsion from the University.

## INTELLECTUAL PROPERTY

The instructor utilizes copyrighted materials under the Freedom and Innovation Revitalizing the United States Entrepreneurship Act of 2007 (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyrighted by the instructor, including, but not limited to, lectures, course discussions, course notes, slides, assessment instruments such as exams, and supplementary materials posted or provided to students authored by the instructor. No recording, copying, storage in a retrieval system, or dissemination in any form by any means of the intellectual property of the instructor, in whole or in part, is permitted without prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of the semester in which this course is held.

## HOMWORK GUIDELINES

When completing homework assignments, your goal is to formulate **complete solutions** to the problems. A solution to a problem is not simply “the answer”, nor is it your original scratch work. A complete solution to a problem is a work of prose which guides the reader through the process of understanding the problem, solving the problem, and verifying the answer. It includes all necessary figures, assumptions, explanations, mathematical steps, and checks. A solution is a **finished product**.

When writing up your homework solutions, follow these guidelines:

- **FORMAT:** Solutions should be hand-written with black or blue pen on clean, white, letter-size paper. Paper may be printer paper or may be lined. If you make a mistake, simply cross it out – no white out or scribbling. No typesetting. No paper ripped from a spiral notebook. Colored pens and graph paper are okay for drawing figures.
- **ORGANIZATION:** Solutions should be labeled by problem number and should be in order. I recommend that you begin each solution on a new page.
- **INCLUDE EXPOSITORY TEXT:** Include sufficient prose to guide the reader through your solution. You should have enough text so that a fellow student in this class who does not know how to solve the problem can follow your work.
- **MAKE YOUR METHODOLOGY CLEAR:** Your strategy for solving the problem should be clear to the reader. Often, you will need to draw a figure in order to define a coordinate system or establish conventions. If you utilize an assumption, model, or approximation that is not stated in the problem then this should be stated. When appropriate, explain why you believe your results to be accurate.
- **MATH PRETTY:** Include all necessary math steps. When writing up your solutions, you may discover that some of the steps you used when first obtaining your solution were superfluous, circuitous, or downright sketchy. Tidy up.
- **CITE REFERENCES:** Give credit where credit is due! If you worked with another student, say so. If you used a reference other than course documents, give a citation (casual references are fine, i.e., “I looked at the Wikipedia article about [Lagrange Tops](#)”). If you use software such as *Matlab* or *Mathematica*, include a printed copy of your notebook or script.

**Please do not give undue attention to the presentation of your solutions.** Following these guidelines may seem daunting at first, but you get the hang of it quickly. Not all problems require a lengthy exposition. Use your judgment.

Official homework solutions posted on [D2L](#) provide good examples of how to write solutions.



## Statements Common to All WCU Undergraduate Syllabi:



### **ACADEMIC & PERSONAL INTEGRITY**

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](http://www.wcupa.edu).

### **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. The OSSD hours of Operation are Monday – Friday, 8:30 a.m. – 4:30 p.m. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is [ossd@wcupa.edu](mailto:ossd@wcupa.edu), and their website is at [www.wcupa.edu/ussss/ossd](http://www.wcupa.edu/ussss/ossd).

### **EXCUSED ABSENCES POLICY**

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.

### **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, Ms. Lynn Klingensmith. 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 Social Equity at <http://www.wcupa.edu/admin/social.equity/>.

### **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](http://www.wcupa.edu/wcualert). To report an emergency, call the Department of Public Safety at 610-436-3311.

### **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.