Syllabus for Physics 300, Fall 2012

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Lectures: MWF 11:00 – 11:50 Merion Science Center 109

Class webpages: Found on West Chester University's D2L site.
You need to be registered to see the course website!

Text & Resources:

Required textbooks: John R. Taylor, *Classical Mechanics* (University Science Books, 2005, ISBN-13: 978-1-891389-22-X), a relatively new textbook which has been used recently for in intermediate undergraduate mechanics courses. Most students who have used it seem to like it, and it is more suited to undergraduates who have not had a dedicated classical mechanics course.

Supplementary texts: Stephen T. Thornton and Jerry B. Marion's, *Classical Dynamics of Particles and Systems*, now in its 5th edition (2004, ISBN: 0-534-40896-6).
An introductory level textbook, e.g., Halliday, Resneck, and Walker, *Fundamentals of Physics*, 8th Edition. Volume 1. John Wiley & Sons, 2008; or *Physics for Scientists and Engineers* 8th Edition, by Raymond A. Serway, John W. Jewett, or many others.

Software: *Mathematica 8.0* by Wolfram Research. This is available from the ACC student helpdesk and is installed on the computers in the Physics Library. There is no need to purchase this as the University has licenses.

Desire2Learn Website:

This course has a Desire2Learn website associated with it, where announcements and course documents will be posted. Report any problems with Desire2Learn by emailing d2l@wcupa.edu or visiting the ACC student helpdesk in 20 Anderson Hall (610-436-3065).

Course Description and Content:

Particle kinematics, dynamics, energy, and momentum considerations; oscillations; central force motion; accelerated reference frames; rigid body mechanics; Lagrangian mechanics (see the tentative schedule section).
Prerequisites: MAT 162 (although Differential Equations and Linear Algebra are STRONGLY recommended, and PHY 140 or 180 (PHY180 preferred).

Course Objectives:

- Develop a deep understanding of the concepts of classical mechanics and the ability to correctly solve a wide range of problems in classical mechanics.
- Exercise and develop problem-solving skills, especially in the cases where the problems have not been previously encountered.

Grading of the Course:

The weight of each portion of the course is as follows:

Exam I:	15%
Exam II:	15%
Exam III:	15%
Final Exam:	25%
Homework:	30%

At the end of the semester, your total numerical course grade is converted into a letter course grade based on the following:

A:	93 and above	C:	73 – 77
A-:	90 – 93	C-:	70 – 73
B+:	87 – 90	D+:	67 – 70
B:	83 – 87	D:	63 – 67
B-:	80 – 83	D-:	60 – 63
C+:	77 – 80	F:	Below 60

Course Requirements:

Exams:

There will be **three midterm exams,** whose dates will be determined as the course progresses. There will be a cumulative **final exam,** two hours long, given during finals week at a date TBD (check D2L later in the semester). The final exam will be cumulative.

Examinations will be **closed book**, i.e. memory aids, class notes, textbooks, etc. are not allowed. Simple scientific calculators may be used in exams (although should not be necessary). If you have other than a simple scientific calculator, you must obtain approval to use it and clear its memory before any quiz or exam.

Homework:

Reading: All students should read ahead in the text(s) to familiarize themselves with ideas that will be presented in lecture. This will allow you to formulate questions about the material and seek clarification during lecture if a concept or technique is unclear.

Problems from the text: There will be about ten to fifteen problems from the text posted at least one week before the due date and these *will not* be graded. Homework solutions will be posted on *D2L* after the due date.

One or more additional problems will be assigned that will require you to submit solutions with the following criteria:

1. **Your solution to any problem must be legible and well organized**.
2. **Your solution must be logically complete**. If the solution to the problem rests on an assumption that is not stated in the problem, you must state that assumption explicitly. For example, "We assume no friction between the block and the table surface" or "We assume that the mass of the ball is negligible compared to the mass of the wall." You must start the solution to a problem with the most abstract and general rule(s) applicable to the problem.
3. Whenever you solve for an unknown, you must (1) **state the equation** you are using to solve for the unknown, (2) **show the substitution of the known values into the equation**, and (3) **show all of the significant steps in the solution for the unknown** (that's at least three lines). You must use subscripts to distinguish variables from one another, and the subscripts should connect to the problem in meaningful ways.
4. **You must be honest**. You should consult the answers online as a last resort. If you are "stuck" on a problem, consult with your instructor or your classmates first, if possible. If you consult the instructor, other faculty, your classmates, or the solution manual, make note of it in your solution. Note precisely where you got stuck and how you got unstuck, who helped you, and what you learned in the process.
5. **Your solution must be yours**. I have no objection to you working with your classmates on a problem, in fact, I encourage it, but your solution should be distinguishable from those of your classmates. If you do work with your classmates on a problem, make a note of it on your solution. Give credit where credit is due.

These will be graded and constitute the homework portion of your grade.

COURSE POLICIES:

Attendance in Lecture

All students are expected to attend all lectures unless officially excused. If you are absent, **it is your responsibility to find out from other students what you missed.** Missing lectures **will not excuse you from any material** covered nor excuse homework, quizzes or exams. In cases of extreme illness or emergency that require prolonged absence, you are responsible for contacting the appropriate Dean whose office will contact your professors and make appropriate recommendations.

Missed Exams

An exam or quiz missed *due to an excused absence* can be made up. See the course instructor to arrange it. Absences for those religious holy days that are not in the university's Academic Calendar and absences for university athletic competitions are excused absences only if the instructor is notified in the first two weeks of class. Most other kinds of excused absence only require that the instructor be notified in advance. There are some emergency situations where it is impossible to inform the instructor in advance and will be dealt with according to University policy. **What is or is not an excused absence is at the sole discretion of the instructor**.

Academic Honesty and Other General Policies

You are **required** to read and comply with the University's Policy on Academic Dishonesty. We reserve the right to photocopy exam papers before returning them to you after they are graded. During

exams and quizzes you are only allowed to have out writing utensils and simple calculators. You are not to have out any other kinds of devices or any pieces of paper other than those provided. We will supply both the test papers and an adequate supply of writing and scrap paper.

For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the Undergraduate Course Catalogue, the Rams Eye View, or the University Web Site. Please understand that improper conduct in any of these areas will not be tolerated and may result in immediate ejection from the class.

ADA Policy Statement.

West Chester University will make accommodations for persons with disabilities. Consult the Office of Services for Students with Disabilities (ext. 3217) and bring the resulting documentation to the instructor.

Withdrawal Notice

A syllabus constitutes a contract between student and instructor. Your continued enrollment after the September 3 drop deadline indicates that you accept all instructional practices, requirements, and policies. If you find the standards to which you will be held accountable too rigorous, if you are unable to reliably access the internet to use Desire2Learn, or if an ongoing scheduling conflict prevents you from attending regularly and punctually, you should officially withdraw (grade "W") through the Registrar's Office by the October 28 course withdrawal deadline. You are responsible for checking your grades before this withdrawal deadline so you aren't surprised by your standing as the end of the course approaches.

Working Together

You are encouraged to study together and work on homework together. Homework is for the purpose of learning to do problems. If you just copy someone else's homework answers *without having tried to do the problems yourself*, you will learn very little from the homework, and you will be at a disadvantage on the tests, where you will have to rely on your own understanding. My suggestion is that you try the problems yourself before asking someone for help. If you get stuck, please post it on the discussion forum on Desire2Learn (and/or come to my office hours); please do not email me. Other students will very likely share your question, and you can learn this material much faster if you work with your peers. Again, I will read and respond in the Desire2Learn discussions. By getting stuck, and then being shown how to overcome that obstacle, you learn more, and what you learn sinks in much better.

Please make use of my office hours, and don't hesitate to email me about any of the following:

- To schedule a time to meet if you cannot make it to any of my office hours
- Questions/feedback related to class organization, syllabus, and grading
- Notification of upcoming excused absences
- Other course-related matters you do not wish to share with your classmates

If you want to ask me a question directly, please do the following: (1) Formulate a proper question and put it in writing. (2) Search for the answer to that question in the information that is already available to you (all documents will be posted on Desire2Learn in electronic form). (3) If you cannot find the answer

to your question in a reasonable amount of time, then determine the best method to contact me (email, or visit). This will result in the most efficient use of your time and mine.

Additional help with physics is available through three different forums: the Learning Assistance & Resource Center, the Department of Physics, and private tutors. More information about tutoring will become available during the second week of the semester

Tentative Schedule:

The course is divided into two parts. The first five chapters are essentially a review of what you learned in your freshman mechanics class with added depth. The second portion is devoted to solving problems with Lagrange's equations and the Euler-Lagrange method starting in chapter 6.

Chapter 1 focuses on the use of vectors and scalars in one, two and three dimensions both in Cartesian and polar coordinates. (three or four lectures)

Chapter 2 treats the familiar projectile and linear motion problems with drag. We will also examine different methods of solving a differential equation, particularly in reference to the Lorentz force applied to a particle in an electromagnetic field. (three to four lectures)

Chapter 3 concerns momentum and angular momentum. It is assumed you can solve collision problems in three dimensional Cartesian coordinates and simple angular momentum problems. The lectures will concentrate on rocket motion and determination of the center of mass of objects and a collection of objects. (two to three lectures)

Chapter 4 deals with the concept of energy. We spend some extra time on the material here than earlier chapters as the concept of kinetic and potential energy is central to Lagrangian mechanics. Path integrals, work and the gradient and curl vector operators will be studied. (about six lectures)

The first exam will most likely occur the last week of September covering the first three chapters and portions of chapter 4.

Chapter 5 takes an in depth look at oscillations. The one-dimensional simple harmonic oscillator is reviewed. The analysis is extended to multiple dimensions and with the effects of damping and driving leading to the concept of resonance. (about 5 lectures)

Chapter 6 is a mathematical prerequisite to the study of Lagrangian mechanics. As such it introduces several new concepts with illustrative geometric examples. (about one week)

Chapter 7 will use the calculus of variation from chapter 6 to develop a completely different and vastly more powerful analysis of classical mechanics. We will show that Newton's laws can be derived by Lagrange's equations. Generalized coordinates will be used to solve complicated systems and the method of Lagrange multipliers will be used to find forces of constraint. (up to three weeks)

Exam 2 will fall somewhere during our study of chapter 7 on October 19th.

Chapter 8 introduces the two body problem where each object's motion depends on the other. The concepts of reduced mass and fundamental orbital mechanics will be discussed. (about four lectures)

The third exam will most likely follow our study of chapter 8.

The remaining time will be used to study selected material in chapters 9 through 11 or as an introduction to Hamiltonian formalism (Chapter 13).