

Physics 420 Classical Mechanics
Fall 2008 Course Document
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Department of Physics

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- Official office hours:
 - Monday 2:00 to 5:00 p.m.
 - Thursday 3:00 to 5:00 p.m.
 - Or by appointment
- If you come by my office unexpectedly outside of the office hours and I'm there, I'll be happy to talk to you unless I'm doing something ultra-critical.
- Department web site: www.cortland.edu/physics/

Course Text

- *Classical Mechanics of Particles & Systems* by Marion & Thornton published by Brooks Cole.
- You may use an earlier edition than the latest one, but be aware that changes, in particular regarding homework problems, may have been made.
- The book covers most topics to some degree. However, I may introduce material scantily covered in or omitted from the text, so keeping good lecture notes is important.
- I recommend that you obtain a book of formulae for reference during this course and in the future. I recommend:
 - *The Cambridge Handbook of Physics Formulas* by Graham Woan published by Cambridge University Press.
 - *Schaum's Outlines Mathematical Handbook of Formulas and Tables*; publisher: McGraw-Hill; author: Murray R. Spiegel.
 - *Physics Handbook for Science & Engineering* by C. Nordling & J. Österman published by Studentlitteratur, Sweden. A very useful book which got me through my undergrad degree.
 - *Mathematics Handbook for Science & Engineering* by L. Råde and B Westergren published by Studentlitteratur, Sweden. This is the accompanying volume to the one above which contains only mathematics.
 - *Handbook of Mathematical Formulas and Integrals* by A. Jeffrey published by Academic Press. This is a good reference book but it contains only mathematics.
 - *AIP Physics Desk Reference* by R. Cohen & D. Lide published by Springer. This is another book I used as an undergrad and can recommend.

although there are others which are equally good. Check with me if you'd like to use a different one.

- There are other texts on classical mechanics which you may want to look at as supplementary texts. A few good ones are:
 - *Classical Mechanics* by T. W. B. Kibble, published by Addison Wesley. This is a very good book covering many of the topics we shall cover.
 - *Introduction to Classical Mechanics* by A. P. French published by Chapman & Hall. This is a good, easy book to follow which covers basic topics, but not everything we shall be discussing.
 - *Mechanics* by Landau & Lifschitz, published by Butterworth-Heinemann. This is volume one of Landau's famous ten volume *Course of Theoretical Physics*. All of the books in this series are very advanced and are typically used at the graduate level. Nonetheless, you could still use it as a reference. Because they have been standard for a while, used copies of these books are easily available. Recent editions are a little overpriced especially given the low quality of printing. If you plan to do a PhD in physics, it would be a good idea to begin collecting this series.
 - *Classical Mechanics* by Goldstein, published by Addison Wesley. This book is also very advanced and is typically for graduate study. The same comments as for Landau apply here.
- The main library may have some useful books covering the topics in the course. You can check at <http://library.cortland.edu/>
- Some cheap books can be found at:
 - www.studentmarket.com/textbooks.html
 - www.directtextbook.com/

Additional Resources

- Here are some more links:
 - For help with mathematical topics and Mathematica (a computer system for mathematics) useage try the Mathematica site <http://mathworld.wolfram.com>
 - For help with Maple (a similar computer system to Mathematica): www.maplesoft.com
 - Physics news: <http://physicsworld.com/cws/home>
<http://www.physicstoday.org/>
 - Physics history: www.physlink.com/Education/History.cfm
 - Google physics links: <http://directory.google.com/Top/Science/Physics/>
 - Calculus resources: <http://archives.math.utk.edu/calculus/crol.html>

Course Content Overview

The course is aimed at Physics majors and will cover classical mechanics. The equations of classical mechanics were originally written down by Newton and these we shall study, although other forms were later

developed which we shall also explore. Topics include Newton's three laws, motion in one, two and three dimensions in particular circular motion, the harmonic oscillator, the central force problem, systems of particles and rigid bodies. To investigate these systems, we shall meet forces, potential energy and angular momentum.

Prerequisite Courses and Knowledge

- Physics 202, Maths 430.
- If you have taken courses like the prerequisites at another institution or here a long time ago, check with me as to whether the prerequisite is satisfied.

Lecture

- Tuesday, Thursday 1:15 to 2:30 p.m. Bowers room 150

Exams

- We shall have two exams during the course of the semester and one final.
- Always write your full name, school ID number, course and section number and my name on your exam.
- I'll give you a formula sheet for the exams, a copy of which I'll give you ahead of time. You may quote anything from the formula sheet without proof (unless specifically asked for proof). For any other formula you remember or derive, you must clearly explain its derivation.
- The final exam will be cumulative. Exams 1 & 2 will cover select topics.
- I may decide to keep either copies or originals of any of your exams.
- For the final exam schedule, check the page:
<http://www.cortland.edu/registrar/finalexamschedule.html>
- The location of the final is listed on the above site. It may not be our usual classroom.
- Exams 1 & 2 and the reviews will, unless I announce otherwise, be in our usual classroom.
- You may not miss an exam without a well documented reason.
- Anybody who cannot attend an exam for legitimate reasons must contact me immediately.
- If you have other exams or tests on the same day as in-class exams, tell me and we may be able to reschedule for you. For conflicts around the final, you must contact the dean's office.

General

- If you are a student with a disability and wish to request accommodations, please contact Disability Services located in Van Hoesen Hall, Room B-40, or call (607) 753-2066 for an appointment. Any information regarding your disability will remain confidential. Because many accommodations require early planning, requests for accommodations will be reviewed in a timely manner to determine their appropriateness to this setting.
- Be sure to check your college email regularly. I may send assignments or other important information this way. You can check at:
<http://webmail.cortland.edu/secure/>

- Always write your name, school ID number, course and section number and my name on any work you submit.
- Class and exam cancellations due to emergencies or bad weather are announced in various ways. See <http://www.cortland.edu/emergency/index.html>
- Check the academic calendar for important dates <http://www.cortland.edu/registrar/calendarinformation.html>
- Some potentially useful info:
 - Student Health Service (607) 753-4811
<http://www.cortland.edu/sdc/hservices/index.html>

Grading Scheme

- Numeric score is based on the following breakdown. Non-writing intensive:
 - Exams 1 & 2, 25% each.
 - Homework 20%.
 - Final Exam 30%.
- Writing intensive:
 - Exams 1 & 2, 20% each.
 - Homework 20%.
 - Final Exam 30%.
 - Writing intensive papers 10%.
- The assignment of letter grades will be decided by me based upon your numeric score. I may take into account attendance and participation. Do not assume any grading rubric not explicitly specified by me.
- If you wish to know of your progress throughout the semester, ask me.
- **Writing Intensive:** The requirement is that you write two papers of at least 15 pages. You are free to choose the topics subject to my approval. It must be broadly related to classical mechanics. I suggest that you begin thinking about this early on in the semester. You will have opportunities for revision of the papers.

Academic Misconduct

- The university policy on academic misconduct can be found at: http://www.cortland.edu/handbook/hb08_10/part3.html#chapter340-200406
- Plagiarism, a serious academic offense, is defined as expropriating the ideas of others and using them as one's own without due credit. Students who cheat in examinations or plagiarize in this course will be disciplined in accordance with university rules and regulations.

Syllabus

- This list is provisional.
- The book covers most topics to some degree. However, I may introduce material scantily covered in or omitted from the text, so keeping good lecture notes is important.

Topics to be covered:

- Newtonian mechanics of a single particle - chapter 2
- Oscillations - chapter 3
- Nonlinear oscillations and chaos - chapter 4
- Gravitation - chapter 5
- Lagrangian and Hamiltonian mechanics - chapter 7
- Central force motion - chapter 8
- Dynamics of systems of particles - chapter 9
- Motion in non-inertial frames - chapter 10
- Dynamics of rigid bodies - chapter 11
- Coupled oscillations - chapter 12