Classical Mechanics

Nota Bene: You *must* visit the course webpage

http://go.owu.edu/~tbkrause/teaching/phys310.html

in order to find more specific information regarding the course.

NB: All **email contact** will come through your ***owu.edu* address**. Make sure you continually check that account, and make sure your inbox is functioning properly.

1 Prerequisites

Formal prerequisites for this course are minimal:

- differential & integral calculus;
- vector calculus;
- introductory physics.

That is, you should be comfortable with taking derivatives and calculating integrals in various dimensions, and you should already have some acquaintance with Newton's laws and some of the more standard topics in introductory mechanics, such as the analysis of simple harmonic motion and motion in a gravitational field.

The other crucial ingredient is the ever-elusive

- mathematical maturity,

a slippery quantity which is as difficult to define as it is to acquire. In essence this means that the student should look beyond mere mechanical calculation to the fundamental underpinnings of a problem, with a view toward its logical structure, its dependence on clear principles, and the distinction between those elements specific to the problem at hand and those which may generalize to other areas.

2 Course Outline

The following chart outlines the format of the course, week by week. Please check the web page periodically to find assignments, as well as any adjustments to adapt the course better to student interests.

Week	Dates	Topic	Chapters
1	Jan. 12–16	Newton's Laws	1, 2
2	Jan. 19–23	Newton's *Principia*	3, 4
3	Jan. 26–30	Harmonic Motion	5
4	Feb. 2–6	Phase Portraits	12
5	Feb. 9–13	Phase Portraits	...
6	Feb. 16–20	Lagrangian Mechanics	6, 7
7	Feb. 23–27	Universal Gravitation	8
8	Mar. 2–6	Elliptical Orbits	...
9	Mar. 9–13	Break	...
10	Mar. 16–20	Hamiltonian Mechanics	13
11	Mar. 23–27	Canonical Transformations	...
12	Mar. 20–Apr. 3	Action-Angle Variables	...
13	Apr. 6–10	Old Quantum Theory	...
14	Apr. 13–17	Perturbation Theory	...
15	Apr. 20–24	Perturbation Theory	...
16	Apr. 27–30	Deterministic Chaos	...

3 Exams & Final Project

There will be midterm exams and a *cumulative* final exam at the end of the semester.

Midterm Exam 1	Tuesday February 16, 2009
Midterm Exam 2	Thursday April 2, 2009
Midterm Exam 3	TBA

The final project is an *open-ended* project of *your own* design, with the intent that you **do something that makes classical mechanics relevant to *you***. That is, do any project that relates classical mechanics to your own interests. See the course web page for further details.

4 Course Policy & Grading

The factors contributing to your grade break down as follows.

Work	Fraction of Grade
Homework	.30
Exams	.45
Final Project	.25

See the course web page for further details.

I will assign letter grades for the final cumulative score according to the following system.

Cumulative Score	Letter Grade
.90–1.00	A
.80–.89	B
.70–.79	C
.60–.69	D
0–.59	F

5 Textbook

The textbook for the class is ***Classical Mechanics***, by John R. Taylor. This appears to be a very well-written text, and will no doubt provide an excellent reference for a broad range of topics. It does not, however, cover all of the topics which I plan to treat during the semester. I will treat some topics in greater depth than the text and others which the text may not even touch upon at all. It is therefore very important that you **attend class and take detailed notes**.