PHYS 331
Classical Mechanics
Fall 2019

Martin Ligare
Office: Olin 164
Phone: 7-1213 or 7-1207
email: mligare@bucknell.edu

Text

- **Classical Mechanics**, John R. Taylor

Course Web Page

- www.eg.bucknell.edu/~mligare/ph331/

Synopsis

Here's the catalog description of PHYS 331:

> Kinematics and dynamics of particles, systems, and rigid bodies. Hamilton's principles, Lagrange's equations, theory of small vibrations, orbital mechanics, accelerated frames, and nonlinear dynamics.

That's a pretty good outline of what we're going to cover, although we are going to extend the discussion of nonlinear dynamics to study deterministic chaos, and we are going to add one additional topic: continuum mechanics.

Many of the topics mentioned above may sound familiar to you, but my goal is to avoid repeating topics that have been covered well in PHYS 211 and PHYS 221. We may spend some time filling in holes in your background along the way, but this course will introduce you to entirely new approaches to mechanics, applications to entirely new kinds of systems, and the use of computer tools to extend the range of problems that we can address.

Grading

3 Mid-semester Exams: 15% each
Final Exam: 30%
Problem Sets and Projects: 20%
Reading Journals: 5%

Tentative Exam Dates

- Exam 1: Friday September 20
- Exam 2: Monday October 21
- Exam 3: Friday November 15

Approximate Schedule

Week of	Topic	Reading
Aug. 26	Newton's Laws	Chapters 1–3
Sept. 2	Energy	Chapter 4
	Oscillations	Chapter 5
Sept. 9	Nonlinear Mechanics & Chaos	Chapter 12
Sept. 16	Nonlinear Mechanics & Chaos	Chapter 12
Sept. 23	Variational Calculus	Chapter 6
	Lagrangian Mechanics	Chapter 7
Sept. 30	Lagrangian Mechanics	Chapter 7
Oct. 7	Lagrangian Mechanics	Chapter 7
	Central Force Problems	Chapter 8
Oct. 14	[Break] Central Force Problems	Chapter 8
Oct. 21	Noninertial Reference Frames	Chapter 9
Oct. 28	Rigid Body Motion	Chapter 10
Nov. 4	Rigid Body Motion	Chapter 10
	Coupled Oscillations	Chapter 11
Nov. 11	Coupled Oscillations	Chapter 11
Nov. 18	Continuum Mechanics	Chapter 16
Nov. 25	Thanksgiving Break	
Dec. 2	Continuum Mechanics	Chapter 16
Dec. 9	Continuum Mechanics	Chapter 16

Bucknell Honor Code

As a student and citizen of the Bucknell University community:

1. I will not lie, cheat, or steal in my academic endeavors.
2. I will forthrightly oppose each and every instance of academic dishonesty.
3. I will let my conscience guide my decision to communicate directly with any person or persons I believe to have been dishonest in academic work.
4. I will let my conscience guide my decision on reporting breaches of academic integrity to the appropriate faculty or deans.

Homework Policy

Most of your learning in this course will come when you work through the problems, in-class exercises, and projects. I encourage collaboration with your peers as you work on the problems, but the work you hand in must be your own articulation of the solutions. I also encourage you to take advantage of my office hours when you and your peers get stuck. Taylor is a popular text used at many colleges and universities, so it is not surprising that solutions to the problems are readily available. Use of solutions written by others, no matter what the source, is not acceptable, and will be regarded as academic dishonesty.

Disability Accommodations

If you have a disability that may have some impact on your work in this class, and for which you may require accommodations, please talk to me about how I can help. You may also submit the Disability Accommodation Request Form or contact the Office of Accessibility Resources at `OAR@bucknell.edu`, 570-577-1188, or in room 107 Carnegie Building so that such accommodations may be arranged.

Learning Goals

As called for in the Department of Physics & Astronomy Learning Objectives, "[m]ajors in Physics (B.A. and B.S) will be able to solve quantitative problems that require an understanding of the fundamental principles in each of the major areas of physics," "show a working knowledge of how a broad array of physical phenomena can be explained using these fundamental concepts," and "[u]se critical thinking skills to formulate and solve quantitative problems." The "major area of physics in this course" is classical mechanics. The level of quantitative problem solving will be that of the text **Classical Mechanics** by John R. Taylor. See above for more details.