Physics 301
Fall 2019 Analytical Mechanics

Instructor: Dr. Brian Bunton

Web page: Moodle (http://moodle.coastal.edu/)

Class Time: TTh 9:25am-10:50am

Class Location: Smith 117

Text: Required: **Classical Dynamics of Particles and Systems (5th edition)**, Thornton & Marion
Recommended: Wolfram *Mathematica* software

Description: PHYS 301 is an intermediate treatment of the analysis of classical systems. Many of the concepts learned in introductory physics will be studied with a greater degree of rigor. Successful completion of a second-semester introductory physics course (PHYS 212 or 213) and a course that covers the basics of differential equations (PHYS 310 or MATH 320) are **required**.

Goals: This course should allow students to obtain a working understanding of classical systems in a variety of ways. A successful student should be able to analyze a wide variety of theoretical constructs and real-world situations.

Topics covered include single particle Newtonian mechanics, oscillations, gravitation, calculus of variations, Lagrangian and Hamiltonian methods, central-force motion, physics of systems of particles, and motion in noninertial reference frames.

Structure: **Lecture** – The traditional lecture portion of the course is where course material is to be reinforced, not introduced. As such, **you are expected to have read the assigned portion before arriving to class**. The class is expected to be informal to some degree, so class participation is highly encouraged.

Problem Sets – Homework is an important component of evaluation in this class. Assignments will be due by 5pm most Fridays. There will be 12 problem sets; most will require the use of computing software such as *Mathematica*. **Collaboration is encouraged, but work submitted must be completely original.**

Exams: There will be three exams: two midterms and a cumulative final exam. Students who have accumulated at least 716 points will be exempted from the final exam. (See Grading below.)

Attendance: Class attendance is vital to your understanding of the subject. If you miss six classes (excused or unexcused), your final grade may be dropped by a letter grade. If you miss eight or more, you may automatically receive a failing grade for the course.

Office Hours: Dedicated office hours for this class will be decided after the first class meeting. I am also quite willing to meet with students at other times. Please get in touch with me and make an appointment; **my schedule is posted on my office door**. I am also available online.

Academic Honesty: The university's academic integrity can be found on the web at https://www.coastal.edu/academicintegrity/code/. In this class, students' signatures on every assignment are confirmations of the students' honor pledges and will be treated as such. Some assignments are meant to be collaborative (labs, group activities), some are meant to be largely your own effort with limited outside help allowed (homework assignments), and some are meant to be completely your own effort (exams). For this course, a first cheating or plagiarism violation will result in a 'zero' grade for that assignment. A second will result in an automatic failing grade for the course.

Grading: To simplify the process of calculating grades, all assignments will be graded proportionally. That means that if an individual assignment is worth 5% of your overall grade, it will be graded out of a possible 50 points. This means it is easier (nearly equivalent, actually) to calculate points instead of percent.

Problem Sets	12	@	40 points	=	480 points
Exams	2	@	160 points	=	320 points
Final Exam			200 points	=	200 points
TOTAL					1000 points

Grading scale:

A	≥ 895 points
B+	845 – 894 points
B	795 – 844 points
C+	745 – 794 points
C	695 – 744 points
D+	645 – 694 points
D	595 – 644 points
F	≤ 594 points

Important Dates:

September 26	Midterm I (2, 3, 6, 7)
November 14	Midterm II (8, 9, 10, 12, 14)
December 12 (11:00am)	Final Exam (cumulative; above plus 13)

Revisions: This syllabus describes the course as best it can. The instructor reserves the right to make changes in its content. If changes must be made to it during the semester, students will be immediately notified.

Et cetera One of the themes of this class is personal responsibility. Your grade in this class will depend on the effort you put into it. If you are having difficulties, come talk to me! I will help you in any way that I can. If there are special circumstances that I should be aware of, such as a learning disability or a planned unavoidable absence, it is **your** responsibility to bring this to my attention within the first week of the course. I will, of course, make any reasonable accommodations that you may need because of it.

Coastal Carolina University is committed to equitable access and inclusion of individuals with disabilities in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. Individuals seeking reasonable accommodations should contact Accessibility & Disability Services via the web (https://www.coastal.edu/disabilityservices) or 843-349-2503.

Student Learning Outcomes for PHYS 301

After successfully completing PHYS 301, a student should be able to...

- articulate knowledge of the most important ideas and methods in physics;
- solve problems with expert-level techniques;
- perform mathematical exercises;
- explain results of mathematical problems in a physics context;
- identify relevant mathematical evidence (theorems, equations, etc.) necessary to support methodology of solving problems;
- interpret solutions to draw reasonable mathematical conclusions;
- appraise the work of others in a constructive manner; and
- implement the mathematical software *Mathematica* as an aide to learning.

Course Schedule

August	22	2.1 – 2.4
	24	2.4 – 2.6
	29	2.6 – 2.7
	30	HW 2A due
	31	3.1 – 3.3
September	5	3.4 – 3.5
	6	HW 2B3A due
	7	3.7 – 3.9
	12	6.1 – 6.7
	13	HW 3B due
	14	7.1 – 7.5
	19	7.5 – 7.9
	20	HW 67A due
	21	7.10 – 7.11
	26	Review and examples
	27	HW 7B due
	28	**Exam I**
October	3	8.1 – 8.4
	5	8.5 – 8.8
	10	9.1 – 9.5
	11	HW 8 due
	12	9.6 – 9.9
	17	10.1 – 10.3
	18	HW 9 due
	19	10.4
	24	12.1 – 12.3
	25	HW 10 due
	26	12.4, 12.6, 12.8
	31	14.1 – 14.3
November	1	HW 12 due
	2	14.4 – 14.6
	7	14.7 – 14.8
	8	HW 14A due
	9	14.9
	14	Review and examples
	15	HW 14B due
	16	**Exam II**
	21	NO CLASS
	23	NO CLASS
	28	13.1 – 13.3
	30	13.4 – 13.6
	5	13.7 – 13.9
	7	NO CLASS
	8	HW 13 due
	12	FINAL EXAM (1:30pm)