SFSU PHYS 701: Classical Mechanics

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Lectures & Office Hours
Lectures: T & Th 12:30-13:45, Thornton 329 and online via Zoom
Office Hours: W 11:00-13:00, online via Zoom

Quick note on e-mail contact
So that I can identify and respond to e-mails from you expeditiously, please put [PHYS701] at the beginning of the subject line. I will respond to emails within 48 hours.

Course Website
ilearn.sfsu.edu – Please check frequently for new announcements, updates to the syllabus & schedule, and links to additional learning resources.

Course Scope
PHYS 701 is an advanced course in classical mechanics. Topics include: the variational principle (the calculus of variations), Lagrangian dynamics (with and without constraints), Noether’s Theorem & symmetries, central forces and potentials (gravitation, Coulomb scattering), accelerating reference frames, rigid-body dynamics, Hamiltonian dynamics. Applications will especially be drawn from celestial dynamics and astrodynamics.

Course Format & Teaching Methods
This is a lecture course. During class time, instructor will present theory and outline applications. Student questions are strongly encouraged throughout class time. Occasionally, students will work on in-class activities in groups.

Course Objectives
(1) To analyze real-world systems in mechanics, to make valid approximations and develop simplified models of such systems, and then to employ Newton’s Laws of Motion, Lagrange’s equations or Hamilton’s equations to determine a system’s temporal evolution.
(2) To understand and apply the fundamental conservation principles of classical physics (energy, linear momentum, angular momentum) and relate them to underlying symmetries of nature.
(3) To develop and apply mathematical tools (vector calculus, linear algebra, differential equations, calculus of variations, numerical/computational methods) to solve problems in classical mechanics.

Learning Materials

Recommended Preparation
Intermediate courses in classical mechanics or dynamics, vector calculus, linear algebra, ordinary differential equations, some computer programming.

Assignment of Grades
Grades will be determined according to the following rubric:
Weekly Homework:  80%
In-class Final Exam:  20%  Thursday, December 16, 2021, 12:30 - 14:30

Letter grades will assigned according to the following scheme:
A: 90.00% – 100.0%  A-: 85.00% – 89.99%
B+: 80.00% – 84.99%  B: 75.00% – 79.99%  B-: 70.00% – 74.99%
C+: 65.00% – 69.99%  C: 60.00% – 64.99%  C-: 55.00% – 59.99%
D+: 50.00% – 54.99%  D: 45.00% – 49.99%  D-: 40.00% – 44.99%  F: 00.0% – 39.99%

I may, at my discretion, curve upwards if I feel my exams were too difficult and/or the class performed above my expectations despite actual course scores. I will never curve downwards.
Homework
You cannot learn physics solely from lectures. You must work through many problems, seeing how the theoretical concepts discussed in lecture apply in various contexts. Homework is an integral part of the learning process; how serious you take the homework will ultimately determine how much you will understand physics and how well you will do in the course overall. There will be approximately one homework assignment per week. Most problems will require analytic solutions, however there will usually be one problem per assignment that will involve graphing and numerical solution with computer software such as MATLAB, Mathematica, or Python.

You can turn in one assignment up to one week late for any or no reason, with no penalty. After that, unexcused late homework assignments will be penalized 25% per week (including Thanksgiving week). All requests for excused lateness will require external documentation.

Policy on Collaboration & Academic Integrity
You are strongly encouraged to discuss course material with your fellow classmates. When working on homework, first try to solve the problems on your own. Struggle. Struggle some more. If you get stuck, feel free to discuss overall methods and approaches with your classmates, but not the details! Your written solutions should be solely your own, and should be written-up in isolation from your fellow classmates. Copying is strictly prohibited. Using the internet to download solutions manuals is also considered cheating. Cheating via any method on exams will result in a grade of zero on that exam and being reported to the department chair and/or college dean for possible discipline. Please see the official plagiarism and academic ethics policies for the Department of Physics & Astronomy at: http://www.physics.sfsu.edu/Academics/Policies.html

Expected Code of Conduct
Classroom discussion and participation are strongly encouraged. However, please refrain from unrelated chatter. Also, please remember to place cell phones and other electronic communication devices on silent or vibration mode so as not to distract your fellow classmates. If you must arrive late or leave early, please sit toward the back of the room near the doors so as to minimize disruption.

Disability Access
Students with disabilities who need reasonable accommodations are encouraged to contact me early in the semester. The Disability Programs and Resource Center is available to facilitate the reasonable accommodations process. The DPRC, located in Student Services Building 110, can be reached by phone at 415-338-2472 (voice/TTY) or by e-mail at dprc@sfsu.edu.

Religious Holidays
The faculty of San Francisco State University shall accommodate students wishing to observe religious and cultural holidays when such observances require students to be absent from class activities. It is the responsibility of the student to inform the instructor, in writing, about such holidays during the first two weeks of the class each semester. If such holidays occur during the first two weeks of the semester, the student must notify the instructor, in writing, at least three days before the date that they will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.

Student Disclosures of Sexual Violence
SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:
   The SAFE Place - (415) 338-2208; http://www.sfsu.edu/~safe_plc/
   Counseling and Psychological Services Center - (415) 338-2208; http://psyservs.sfsu.edu/
   For more information on your rights and available resources - http://titleix.sfsu.edu
Health & Safety Commitments

Your health and safety are our paramount concern at SF State. We ask every member of our campus community to join a pledge to make and follow plans to keep fellow students, faculty, and staff safe and well. Feeling confident, safe, and well will help you focus on your academic success. To participate in this class, all students are expected to:

- stay informed on the most up-to-date information related to SF State's COVID-19 response and Campus Comeback plan;
- plan ahead for possible class disruptions due to COVID-19 or other unexpected events, such as unhealthy air quality caused by smoke;
- take care of yourself and others by staying home when you aren’t feeling well or believe you have been exposed to COVID-19;
- follow all required health and safety guidelines, including verifying your proof of vaccination or exemption status before coming to class, wearing a multilayered mask over your nose and mouth at all times when indoors on campus, and washing your hands as often as possible with soap and water or hand sanitizer.

For more information about SF State's response to COVID-19 and how you can keep yourself and others safe and well, visit the Campus Comeback Website. To plan for how you will maintain your academic success when unexpected events disrupt regular teaching and learning activities, follow the information on the course syllabus and consult the Keep Learning guide.

Recording of Lectures & Privacy

As the instructor of this course, I will be using Zoom to record our class sessions/lectures for the sole purpose of supporting student learning. To maintain privacy, I will post links to the recordings in our campus’s learning management system iLearn to limit access to the members of this course only. It is expected that students also refrain from sharing these recordings outside the context of this course. Students who have privacy concerns may turn off their video and/or change their user name for the duration of the session.

At the beginning of each recorded Zoom session, you will be prompted to acknowledge that the session is being recorded and that you would like to continue in the session. These recordings will be retained for one semester beyond the end of this course, to support students who may have received an incomplete grade, and will then be deleted. As always, any student who has concerns about these recordings may speak with me at any time during the semester to discuss your concerns.