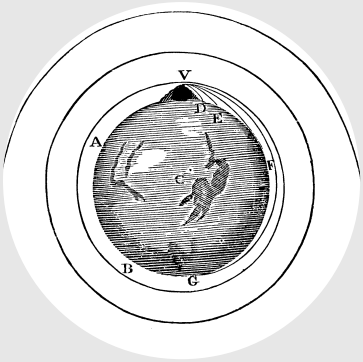

Classical Mechanics
PHYS 3100

Instructor Info

Professor Ferroglia

Office Hr: Monday 9:00 - 10:00 am

-online- Blackboard Collaborate

https://www.citytech.cuny.edu/faculty/AFerroglia

aferroglia@citytech.cuny.edu

Course Info

Prereq: PHYS1442, MAT1575

Mon & Wed

10:00-11:40 am

online

About

This course deals with classical mechanics, a topic that you should be already familiar with from your first general physics course. However, here we will learn that over the centuries several people developed approaches that simplify and streamline the task of finding the differential equations that one needs to solve in order to know how an object moves in space. In addition, we will see that thinking about mechanical problems in terms of Lagrangians and Hamiltonians is often of great help in understanding the dynamics of a physical system. Finally, throughout the course we will see that mechanics problem can and should be treated with rigorous mathematical tools that are more advanced that the ones you used in your introductory physics courses.

Syllabus - Fall 2020

Created on: 08/22/2020

Overview

This course offers a study of classical mechanics from a more advanced perspective than freshman physics, with particular emphasis on Lagrangian and Hamiltonian formalisms. Topics include a review of Newtonian mechanics and the principle of conservation of energy and momentum, as well as the study of calculus of variations, Lagrange' s equations, two bodies central force problems, mechanics in non-inertial frames, rigid bodies, Hamiltonian mechanics, and collision theory.

Material

Recommended Text

Classical Mechanics, John R. Taylor, University Science Books (2015). ISBN-1-891389-22-X

Online Resources

Classical Dynamics, David Tong, available at http://www.damtp.cam.ac.uk/user/tong/dynamics/clas.pdf

Grading Scheme

30%	Exam 1	Grades will follow the standard
30%	Exam 2	
40%	Final Exam	

scale: A = 93-100, A- = 90-93, B+ = 87 - 90, B = 83-87, B- = 80-83, C+ = 77-80,C = 70-77, D = 60-70, F < 60.

Exam Policy

- All students are expected to connect on time for all lecture meetings and exams.
- Any student absent from an exam will be given a grade of zero for the exam unless he or she provides a doctor's note of explanation.
- Students will be allowed to prepare and use during the exam a handwritten, one-page letter format formula sheet.

Homework

Homework problems will be assigned during the semester. Homework assignments will not be graded. However, it is extremely important that students solve the homework problems and ask any problem-related question they might have to the instructor.

Learning Objectives

- Acquire some of the mathematical tools and formalisms that are needed for a rigorous discussion of mechanical problems.
- Learn how to write the Lagrangian of a physical system and learn how to use it to derive the equations of motions that describe the behavior of a given physical system.
- Learn how to write the Hamiltonian of a physical system and learn how to use it to derive the equations of motions that describe the behavior of a given physical system.
- Solve in detail several advanced standard problems in classical mechanics, such as the two-body problem for two objects interacting through gravity and the study of rotational motions of a rigid body in three dimensional space.

FAQs

How do I study for this course?

As usual it is crucial to read the book by following each calculation with pencil and paper while you read. The goal is to be able to derive each single equation in the chapters that we discuss in class. This kind of work takes time but it pays off in the end.

Where do I find the lecture notes discussed in class?

The course website with the lecture notes that will be discussed in class can be found at this link. Lecture notes do not replace, but complement the books

Will homework be assigned?

Problems will be assigned in almost every class meeting. The solution of some of the assigned problems will be discussed in each class meeting. While homework does not count toward the final grade, solving homework problems is absolutely necessary to prepare for the in-class exams.

Where was Lagrange from?

Lagrange was born in what is now Italy (in the city of Turin to be precise) in 1736. At the time that part of the world was part of the Kingdom of Piedmont and Sardinia. He moved to Berlin in 1766. Finally in 1786 he moved to Paris where he resided until his death in 1813. He became a French senator in 1799, and in 1802 he signed the act that annexed his fatherland Piedmont to France. He acquired French citizenship in consequence.

Class Schedule

Week	Topic	JT Book	DT Lecture
1	Newton's Laws of Motion	Ch 1	Ch 1
2	Air Drag	Ch 2	–
3	Linear and Angular Momentum	Ch 2	Ch 1
4	Energy	Ch 4	Ch 1
5	Oscillations	Ch 5	–
6	Calculus of Variations	Ch 6	Ch 2
7 & 8	Lagrangian Mechanics	Ch 7	Ch 2
9 & 10	Two-body Problems	Ch 8	Ch 2
11 & 12	Hamiltonian Mechanics	Ch 13	Ch 4
13 & 14	Rigid Bodies	Ch 10	Ch 3
15	Review and Final Exam		

Class/Assignment Rules

You are encouraged to talk to each other in class and beyond, but your assignments need to be the result of your own work. Identical or very similar assignments are not acceptable. This is valid also for longer assignments and reports. Using online sources as inspiration for assignments is allowed but sources should be cited. Using large chunks of text from outside sources in reports is not allowed and will be considered plagiarism.

Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York (CUNY) and at New York City College of Technology (CityTech) and is punishable by penalties, including failing grades, suspension, and expulsion.

Diversity and Inclusivity Statement

The University respects individuals while acknowledging the differences among them. These differences include, but are not limited to, race, national-origin, ethnicity, religion, age, gender, sexual orientation, gender identity, disability, and socioeconomic status. However in order to create a vibrant academic, intellectual, and cultural environment for all, the University must move beyond representation to genuine participative membership. Thus, the University seeks to develop a community that is inclusive of all individuals and groups. Given CUNY's long history of proactive support for diversity and inclusion, it is uniquely positioned to build upon that strong foundation and serve as a national leader and model, exemplifying the benefits that accrue when diversity and inclusion are integral components of an institution' s educational philosophy and core mission.

Accommodations for Students with Disabilities

City Tech is committed to supporting the educational goals of enrolled students with disabilities in the areas of enrollment, academic advisement, tutoring, assistive technologies and testing accommodations. If you have or think you may have a disability, you may be eligible for reasonable accommodations or academic adjustments as provided under applicable federal, state and city laws. You may also request services for temporary conditions or medical issues under certain circumstances. If you have questions about your eligibility or would like to seek accommodation services or academic adjustments, please contact the Center for Student Accessibility at 300 Jay Street, Room L-237, Phone 718-260-5143 or http://www.citytech.cuny.edu/accessibility/.