PHYSICS 6321, Classical Dynamics, Spring 2017

Syllabus v1.1 -- 2017-02-26 (Hal Edwards)

Text: Goldstein, Poole, & Safko, *Classical Dynamics*, 3rd ed.

Meeting time and place: Tue & Thu 7-8:30PM Fondren (room TBD)

Instructor: Hal Edwards (edwards@ti.com, cell 214/882-1498)

Date	Day	Topic
Mar 9 2017	THU	Midterm review
Mar 14 2017	TUE	SMU spring break March 13-17
Mar 21 2017	TUE	Midterm
Apr 14 2017	FRI	SMU holiday
May 4 2017	THU	Final review
May 11 2017	THU	Final Exam Date

Learning objective: Students will be able to solve problems involving classical mechanics at a graduate level using Lagrangian and Hamiltonian methods.

Prerequisite assumptions: Students should have an undergraduate level mastery of classical mechanics, as well as fluent math skills in calculus, differential equations, and linear algebra.

Course scope: The lectures, homeworks, and tests follow the course text Goldstein, covering most of chapters 1-6 and parts of chapter 8.

Educational philosophy: A successful student will work independently between lectures to understand the course text Goldstein through reading, derivations, and homework problems. Proficiency in solving problems is the course goal. This can be achieved through consistent and timely effort.

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Grading: Grading will be balanced between class participation (30%), homework (30%), a midterm exam (20%), and a final exam (20%).

Participation: There will be required reading from Goldstein for every lecture. Students will take turns teaching selected derivations from Goldstein chapters based on the assigned reading. Students also will take turns presenting homework solutions on the day that homework is due. The goal is to maximize learning by active participation by students and to minimize passive lecture time. If a student is distracted by use of a computer, tablet, phone, or other electronics, they may lose participation credit for that lecture.

Attendance: Attendance is a required part of participation. For medical, religious, SMU activity-related, or other major reasons requiring an absence, a summary of the relevant elements of SMU policy is the appendix below.

Homework: Homework is due at the beginning of the lecture on its due date. No late homework will be accepted. Problems will be assigned from the course text Goldstein. Students must show their work clearly and explain their assumptions. If computer-based tools are used for numerical solutions, printouts of the result and the code should be provided. However, derivations and other work should be done by hand and explained by the student in their own words. Plagiarism is not acceptable. Homework pages should be stapled in the upper left corner. Homework #, problem #, and the student's name should be written on each page.

Tests: There will be in-class midterm and final exams that are intended to verify mastery of the course subject matter. Problems will be based on the methods in the course text Goldstein. The course text Goldstein may be used during the tests. Computers, tablets, phones, or other electronics may not be used for tests unless otherwise noted by the instructor at the time of the test.

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Lecture calendar:

Date	Day	What	Topic	Reading	In-class work
1/24/17	TUE	Lecture 1	Intro, review, math	N/A	math quiz for ch 1-3
1/26/17	THU	Lecture 2	Mechanics of a system of particles	1.1-1.2	Derivations 1:1, 1:2
1/31/17	TUE	Lecture 3	Constraints, Lagrange's equations	1.3-1.4	Derivations 1:4, 1:6
2/2/17	THU	Lecture 4	Dissipation	1.5	Derivation 1:8
2/7/17	TUE	Lecture 5	Applications of the Lagrangian formulation	1.6	Derivation 1:10
2/9/17	THU	Lecture 6	Hamilton's principle, Calculus of variations	2.1-2.2	HWK 1
2/14/17	TUE	Lecture 7	Lagrange's eqn's from Hamilton's principle	2.3	Derivation 2:1
2/16/17	THU	Lecture 8	Hamilton's principle with constraints	2.4	Derivation 2:4
2/21/17	TUE	Lecture 9	Symmetries and conservation laws	2.5-2.7	Derivation 2:3, 2:22
2/23/17	THU	Lecture 10	The central force problem	3.1-3.3	HWK 2
2/28/17	TUE	Lecture 11	Virial theorem; central force problem	3.4-3.6	Derivation 3:1, 3:9
3/2/17	THU	Lecture 12	The Kepler problem	3.7-3.9	Derivation 3.2, 3.3
3/7/17	TUE	Lecture 13	Scattering	3.10-3.11	Derivation 3:6, 3:7
3/9/17	THU	Lecture 14	Midterm review	Ch 1-3	Midterm review prob's
3/21/17	TUE	Lecture 15	Midterm	Ch 1-3	Midterm
3/23/17	THU	Lecture 16	The kinematics of a rigid body	4.1-4.3	4:1, 2, 3, 4, 10, 11
3/28/17	TUE	Lecture 17	Euler angles	4.4,4.6-7	4:5, 4:9, 4:13
3/30/17	THU	Lecture 18	Rotations and the Coriolis effect	4.8-4.10	4:14, 4:17, 4:20
4/4/17	TUE	Lecture 19	The rigid body equations of motion	5.1-5.3	5:1, 5:2, 5:14
4/6/17	THU	Lecture 20	The inertia tensor, torque-free motion	5.4-5.6	5:3, 5:15, 5:16
4/11/17	TUE	Lecture 21	Examples of rigid body motion	5.7-5.8	5:4, 5:7, 5:9
4/13/17	THU	Lecture 22	Oscillations, eigenvalue, normal coord's	6.1-6.3	6:19, 6:20, 6:23
4/18/17	TUE	Lecture 23	Applications of oscillations	6.3-6.4	6:1, 6:2, 6:5
4/20/17	THU	Lecture 24	Dissipation and driving force	6.5	6:4, 6:10, 6:12
4/25/17	TUE	Lecture 25	Special relativity	7.1-7.2	7:2, 7:13, 7:14
4/27/17	THU	Lecture 26	The Hamilton equations of motion	8.1-8.3	8:1, 8:4, 8:5
5/2/17	TUE	Lecture 27	The principle of least action	8.5-8.6	8:8, 8:9, 8:10
5/4/17	THU	Lecture 28	Final review	Ch 1-8	Final review prob's
5/11/17	THU	Final exam	Final Exam	Ch 1-8	Final

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Homework calendar:

Date	Day	Homework due	Homework details
Feb 9 2017	THU	hwk 1	1:13, 1:18, 1:19, 1:20, 1:21, 1:23
Feb 23 2017	THU	hwk 2	2:6, 2:7, 2:13, 2:19, 2:24, 2:25
Mar 9 2017	THU	hwk 3	3.11, 3.14, 3.15, 3.19, 3.24, 3.34
Apr 6 2017	THU	hwk 4	4.21, 4.22, 4.23, 4.24, 4.25
Apr 20 2017	THU	hwk 5	5.13, 5.22, 5.24, 5.25, 5.26, 5.29
May 4 2017	THU	hwk 6	6.7, 6.8, 6.9, 6.15, 6.20, 6.21

APPENDIX: SMU Policies on Disability Accommodations, Religious and Excused Absences

Disability Accommodations: Students needing academic accommodations for a disability must first contact Ms. Rebecca Marin, Coordinator, Services for Students with Disabilities (214-768-4557) to verify the disability and establish eligibility for accommodations. They should then schedule an appointment with the professor to make appropriate arrangements. (See University Policy No. 2.4.)

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities: Students participating in an officially sanctioned, scheduled University extracurricular activity will be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)