Syllabus
University of Maryland College Park
Physics 410 -- Classical ~~Mechanics~~ Dynamics
Fall 2019

Professor: Daniel P. Lathrop
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E-mail: talk to me after lecture please, email is not effective given the volume. Elms mail might work.

Graduate Teaching Assistant: Masoud Arzanagh
Masoud is the main point of contact for the course by elms mail.

Location and times: Tu-Th 9:00am-10:50am PHY 1201 (Toll Physics Building)

Classical is essentially a mind-bending version of Newton's laws. Aircraft, spacecraft, hand-tools, machine tools, planets, and solar systems all perform dynamics substantially rules by classical dynamics. Our class will focus on ideas needed to understand nature and technology as well as the techniques that you might need to use in your careers. If at any point in the course you do not know how what we are discussing is useful and important, please ask! Moreover, if at any point you have any question at all, please ask! Lecture participation is graded via an in class sign in sheet.

Grading:

Homework	30%
Two in class midterms	15%+15%
Project	15%
Lecture participation	10%
Final	15%

Please work in groups to do the homework, and discuss strategies on each problem. The strategy of simply verbatim copying other's homework both violates UMDs honor code, and also ensures you cannot possibly pass the midterms and final. Ethics is the bedrock of trust. Trust is the bedrock of your future performance in teams who will rely on you.
Homework: Will be assigned on elms and due in class.
Late homework: Late homework turned after the due date is worth 50% of the points earned. After the solutions are distributed for that homework (usually one week later) late homework is not accepted.

Book: John R. Taylor "Classical Mechanics". Edited version of the cover here with different graphics and title.

Classical Dynamics

John R. Taylor

Project:
Projects can be theoretical (analytical), computational, or experimental. The most important thing is to choose a project that you have interest in. Of course the project subject must be relevant to classical dynamics, and related either to things covered in lecture or in the text. Projects subjects must be approved by Dr. Lathrop.

Project proposals are due at the second midterm. The proposal is a single page, but must include: tentative project title, a one paragraph description of the project activity, desired project results, and a list of needed resources if any. The proposal counts for 10% of the project grade. Individual or group projects are fine. Group project need to have well defined roles for group members and a final group cross-evaluation.

The final product will be a five page typed report due the last day of class. Formatted as a research paper, it will include a title, abstract, introduction/background, project description, results, conclusion and references. The project will be turned in on elms. Figures and bibliography can be included in the 5 pages, and the text can be single or 1.5 line spaced with font size set at 12 point. If the project is experimental and has safety hazards they should be detailed in the proposal, together with safety mitigation plans. Those need to be approved by Dr. Lathrop prior to any experiments.

Random project suggestions (but come up with your own if you please):

- Novel trajectories for Mars missions (theoretical/computational)
- A detailed report of the status of the Earth/Sun Lagrange points including their stability and the orbiters currently known to be there (full court press)
- Inelastic spin-down of a titanium compressor (experimental)
- Analysis of a driven damped double pendulum (experimental or computational)
- Analysis of orbital dynamics nearby a cosmic string (theoretical)
- Solar system formation (computational)
- Acoustic or elastic modes of ****choose one**** PHYS 1201, the physics maker space, the big blue bear art at whole foods, your upper torso, the bridge leading to Looney's, etc. (experimental or computational).

Tentative Schedule:

Week	Week of	Main Topics	Ch. in Taylor
1	Aug. 26	Overview and Newton's laws	Ch. 1
2	Sept. 2	Momentum and Angular M.	Ch. 2+3
3	Sept. 9	Energy and phase space	Ch. 3+4
4	Sept. 16	Energy and phase space	Ch. 4
5	Sept. 23	Oscillations	Ch. 5
6	Sept. 30	Oscillations and Lagrange's Eq.	Ch. 5+7
7	Oct. 1	First Midterm	Sleep well. You will do well if you have done all the homework and attended all the lectures.
7	Oct. 7	Lagrange's Equations	Ch. 7
8	Oct. 14	Orbital dynamics	Ch. 8
9	Oct. 21	Dynamics in non-inertial frames	Ch. 9
10	Oct. 28	Rotational motion	Ch. 10
11	Nov. 5	Second Midterm Project proposals due	Sleep well. You will do well if you have done all the homework and attended all the lectures.
11	Nov. 4	Coupled oscillators	Ch. 11
12	Nov. 11	Coupled oscillators + nonlinear	Ch. 11+12
13	Nov. 18	Nonlinear dynamics and chaos	Ch. 12
14	Nov. 25	Continuum mechanics	Ch. 16
15	Dec. 2	Continuum mechanics	Ch. 16
Last class Final	Dec. 9 To be determined	Hyper-dimensional rodeo Think calm thoughts	Sleep well, trust me here, you will do well if you have done all the homework and attended all the lectures.