

Physics 6321:

Classical Mechanics

Spring 2019

MWF 9am Rm 157

Instructor: Professor Fredrick Olness
Office: Room 201, Fondren Science
Telephone: 768-2500
olness@smu.edu

Office Hours I am available most any time, especially following class, and from 2-4 most afternoons. For a class this size, I find it easier if you just set up an appointment individually. I am also available for review sessions before the exams if requested.

Text: *"Classical Mechanics"* by H. Goldstein, (either 2nd or 3rd edition)

Optional Reference: *"Mathematica for Physics"*
by R. Zimmerman & F. Olness (2nd Edition)

COURSE WEB PAGE:

Linked from below under "Physics Courses"
www.physics.smu.edu/olness

Grading: The final course grade will be determined as follows. Homework 40%, Exams 40%, Final 20%.

Homework: Homework is to be handed in as scheduled. Even though the homework is graded, you are encouraged to work together on the assignments. If you find the homework too easy, then you can practice tutoring your classmates.

Homework is roughly assigned weekly, and solutions are posted on the web following the assignments; these are often in Mathematica so you can try out the solutions interactively.

Exams: There will be 3 exams during the semester, in addition to the final.

General Topics Covered:

- **Newton's Laws**
- **D'Alemberts Principle**
- **Lagrange Equations**
- **Principle of least action**
- **Calculus of variations**
- **Kepler problem, and variations**
- **Rigid body mechanics**
- **Groups, Rotation matrices**
- **Small Oscillations**
- **Special Relativity**
- **Hamilton's Equations**
- **Legendre Transformation**
- **Canonical Transformation**
- **Poisson Brackets & connection to QM**
- **Hamilton-Jacobi Equations**
- **Canonical Perturbation Theory**
- **Chaos**

References:

Classical Mechanics. (2nd or 3rd Edition) by Herbert Goldstein

Classical Mechanics with Applications, by Porter Wear Johnson

A fresh, modern approach to mechanics w/ 150 exercises.

Mechanics, by Keith R. Symon

A classic! Provides an intuitive introduction to relativity, cosmology, quantum mechanics, and more.

Classical Dynamics of Particles and Systems. by Thornton and Marion

Mathematica for Physics. by Zimmerman and Olness

Schaum's Outline of Mathematical Handbook of Formulas and Tables

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#	DAY	LECTURE:	NOTES:	Chpt	TOPIC
1	FRI	Jan 18	Classes begin	0	Introduction and course overview
2	MON	Jan 21	MLK Holiday		
3	WED	Jan 23		1	Survey of Elementary Principles
4	FRI	Jan 25			
5	MON	Jan 28		2	Variational Principles
6	WED	Jan 30			
7	FRI	Feb 01		2	Lagrange Equations
8	MON	Feb 04			
9	WED	Feb 06		3	Central Force Problem
10	FRI	Feb 08			
11	MON	Feb 11		3	Scattering Theory
12	WED	Feb 13			
	THUR	Feb 14	EXAM 1		Exam
13	FRI	Feb 15		4	Rigid Body Motion
14	MON	Feb 18			
15	WED	Feb 20		4	Group Theory & Rubik's Cube
16	FRI	Feb 22			
17	MON	Feb 25		5	Rigid Body Equations of Motion
18	WED	Feb 27			
19	FRI	Mar 01		6	Small Oscillations
20	MON	Mar 04			Differential Equations
21	WED	Mar 06			Fourier Transforms
	FRI	Mar 08			
	MON	Mar 11	Spring break		
	WED	Mar 13	Spring break		
22	FRI	Mar 15	Spring break		
23	MON	Mar 18		6	Green's Functions
24	WED	Mar 20			
	THUR	Mar 21	EXAM 2		
25	FRI	Mar 22		7	Special Relativity
26	MON	Mar 25			
	WED	Mar 27			Relativistic Invariants
27	FRI	Mar 29			
28	MON	Apr 01			Relativistic Transformations
29	WED	Apr 03			
30	FRI	Apr 05		8	Hamilton's Equations

31	MON	Apr 08	Drop Day		
32	WED	Apr 10			
	THUR	Apr 11	EXAM 3		
33	FRI	Apr 12		9	Canonical Transformations
34	MON	Apr 15			
35	WED	Apr 17		10	Hamilton Jacobi Theory
36	FRI	Apr 19	Good Friday		
37	MON	Apr 22			
38	WED	Apr 24			Action Angle Variables
39	FRI	Apr 26			
40	MON	Apr 29		11	Chaos
41	WED	May 01			
42	FRI	May 03			Exam review
	MON	May 06	Last class		
	FRI	May 10	FINAL EXAM	Friday May 10,2019, 8am - 11am	
<i>Adjustments may be made depending on student interests/needs and unplanned events</i>					



SMU

Steven C. Currall

Provost and Vice President for Academic Affairs

Office of the Provost

13 August 2018

Dear Colleagues:

Welcome back to the 104th Autumn Term on the Hilltop! We are excited to welcome the Class of 2022. As a group they come from 43 states and 24 countries. They are valedictorians, entrepreneurs, athletes, performers, student body presidents, and leaders in their communities. These new freshman and transfer students will be joining our current student body bringing the total number of undergraduates on campus to more than 6,500.

As you finalize your syllabi for this academic term, please communicate the following to your students. Sharing this information in writing will create a record that you have outlined the accommodations provided for by University policy. This also provides students with a reminder not only of the policies themselves, but also of how to access the services and accommodations available.

(Please Note: The Disability Accommodations statement has been updated and should be copied/pasted as is. Please do not add, subtract, or copy the old statement from a previous syllabus. Exception: Law school faculty members should consult with Stephen Yeager, Assistant Dean for Student Affairs, for the specific statement appropriate for law syllabi.)

- **Disability Accommodations:** Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/ALEC/DASS> to begin the process. Once registered, students should then schedule an appointment with the professor as early in the semester as possible, present a DASS Accommodation Letter, and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.
- **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 should 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. (See [2018-2019 University Undergraduate Catalogue](#))
- **Student Learning Outcomes:** Please include in your syllabi all student learning outcomes, both those specific to your course, as well as those that satisfy major and general education requirements.
- **Final Exams:** Final course examinations shall be given in all courses where they are appropriate, and some form of final assessment is essential. Final exams or final assessments must be administered as specified in the official examination schedule, and shall not be administered during the last week of classes or during the Reading Period. Please state clearly in the syllabus the date/time and form of the final exam or assessment.

In the attached, I have provided additional recommendations and resources that should improve the classroom experience for you and your students. Additionally, you may wish to share the attached pages (2018 Know What to Do and the DASS informational sheet with your students).

If you wish, you may also include the following statement regarding the “campus carry” law: “In accordance with Texas Senate Bill 11, also known as the “campus carry” law, following consultation with entire University community SMU determined to remain a weapons-free campus. Specifically, SMU prohibits possession of weapons (either openly or in a concealed manner) on campus. For more information, please see: http://www.smu.edu/BusinessFinance/Police/Weapons_Policy.”

As you begin the semester, please see the attached pages listing other recommendations and more information about DASS. Thank you for your help with this. A copy of this letter and the attachments will be posted this week on the Office of the Provost website under “[Provost’s Communications](#).”

Sincerely,



Steven C. Currall, Ph.D.
 Provost and Vice President for Academic Affairs
 David B. Miller Endowed Professor
 Professor of Management and Organization
 Professor of Psychology
 Professor of Engineering Management, Information, and Systems

DISABILITY ACCOMMODATIONS & SUCCESS STRATEGIES

WHAT WE DO

DASS coordinates the provision of classroom accommodations and disability access on campus. As part of the Altshuler Learning Enhancement Center (A-LEC), DASS operates under the University Provost's office. The DASS team:

- reviews documentation to determine eligibility for services;
- creates accommodation letters for students to use with faculty;
- facilitates test proctoring services when faculty are unable to provide this;
- offers disability awareness training for campus departments;
- provides academic coaching for students with learning differences;
- refers students to on and off-campus support.

Please review our website for more details, and read our faculty newsletter, the DASS Insider, which comes out by email twice a semester and can be found on our website.

WHERE WE ARE

Team Offices and Student Support

The DASS team is located within the Altshuler Learning Enhancement Center (A-LEC) at: **202 Loyd Ctr. or 5800 Ownby Dr.**

Entrance to our building is adjacent to Gate 3 of Ford Stadium. Take the elevator to the 2nd floor. Parking for faculty/staff is behind and under the Meadows Museum.

Test Proctoring Services

We strongly encourage students and faculty members to work out test accommodations themselves. In the event that a faculty member is not able to provide the accommodations, DASS serves as a back up (at a cost to the University). Our administrative assistant coordinates this process with faculty and students. Please contact our office for more details, or review the information on our website under "Test Proctoring."

WHO WE ARE

Associate Director:

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Learning Specialist:

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&

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Administrative Assistant: Candy Brown – 202M

ADDITIONAL RECOMMENDATIONS

- **Attendance:** Faculty are encouraged to take attendance. Please state clearly in the syllabus how attendance will be taken and how the attendance information may be used in determining a student's class participation or final grade. You may find using the attendance function in Canvas particularly helpful so that you and the student have an accessible record of their attendance. Taking attendance not only encourages classroom engagement but also helps to identify potentially at-risk students. In accepting the recommendations of the President's Commission on Substance Abuse, President Turner has asked that all faculty "announce and utilize an attendance policy, emphasizing the importance of attendance in meeting academic expectations and enabling faculty to take note of frequent or long absences, a potential sign of student distress." If you find that a student is frequently absent from class, stops attending class, or has a period of non-attendance, please contact the student's records office or access the Caring Community Connections website at www.smu.edu/deanofstudentsccc to notify the Dean of Student Life of non-attendance.
- **Early and Midterm Progress Reports and Grading:** Faculty are encouraged to have quizzes, tests or other forms of assessment throughout the semester. The official midterm grade is due Week 11 of classes, but it is recommended that students be assessed by Week 6 or 7 so they may make adjustments. Faculty are also strongly encouraged to complete the early and midterm progress reports sent by the Registrar's Office and the Altshuler Learning Enhancement Center. Both offices will send you links and email reminders during the semester. Advisors and students use these reports to identify courses in which the student is academically at-risk. It is particularly important for you to report a student with a midterm grade of C- or below.
- **Course Grade:** In your syllabus, please inform students about how final course grades will be determined, including information pertinent to your grading decision, such as class participation.
- **Office Hours:** Faculty are expected to have designated office hours. Please state your office hours in the syllabus.
- **Academic Misconduct:** Academic misconduct of any kind is prohibited by the SMU Student Honor Code. Faculty who suspect plagiarism or cheating should consult <http://smu.edu/honorcouncil/> for appropriate actions and options.
- **Syllabus Repository:** After you have finalized your syllabus please upload a digital copy to the SMU syllabus repository (<https://sites.smu.edu/des/syllabus/>) which can only be accessed by members of the SMU community.

GET INFORMATION & KNOW WHAT TO DO DURING AN EMERGENCY

- Ensure you will receive SMU emergency notifications: Update your cell phone # in My.SMU.edu
- During an emergency, look for information updates through texts, www.smu.edu, Twitter (@SMU), or Facebook.
- View safety videos at www.smu.edu/emergency

LOCKDOWN

Run, Hide, or Fight



WHEN

You will receive this notice if there is an intruder with a weapon or the threat of another type of violence on campus.

ACTIONS (Depending on your personal situation and location)

- **RUN** – go to a safer location, if that is an option
- **HIDE** – get out of sight, remain quiet; lock doors when possible
- **FIGHT** – confronted with the violence, collaborate with others to distract the intruder and get away or defend yourselves
- Warn others and call 214-768-3333 if you have information for Police
- Wait for campus officials to notify you when to return to normal activities

SEEK SHELTER

Find a safe place in a building



WHEN

Outdoor warning sirens sound to signal there is severe weather or environmental danger outside

ACTIONS

- **Go Inside** a building, to bathrooms or interior halls, away from glass doors and windows
- Monitor one or more media sources
- Wait for campus officials to notify you when to return to normal activities

EVACUATE

Leave your building immediately



WHEN

Indoor alarms sound or strobe lights flash to signal there is a danger inside or near the building, such as fire

ACTIONS

- **Go Outside** the building; assist those who are disabled
- Take valuables and cell phone with you
- Proceed to the assembly area outside
- Wait for campus officials to notify you when to return to normal activities.