

PHY303K—FALL 2016, MWF 8-9 a.m. in PAI 2.48

Professor Harry L. Swinney, office RLM 14.224

chaos.utexas.edu/swinney

>> Please move to the center seats in rows A and B; D and E; G and H.

> Leave rows C, F, J, K, and L empty.

Required Discussion Sessions on Tuesdays, starting Tuesday August 30, 2016:

6 pm (Unique 55675), 7 pm (55680), 8 pm (55685)

BOOKMARK THESE:

First Day Handout:

<https://web2.ph.utexas.edu/~303kcom/swinney/303k-f2016-first-day-handout.pdf>

Syllabus: https://web2.ph.utexas.edu/~303kcom/PHY303K-Syllabus_Fall_16.htm

TEACHING TEAM:

(TA=Graduate Teaching Assistant; LA=Undergrad Learning Assistant)

Professor H. Swinney, swinney@chaos.utexas.edu, RLM 14.224

Professor T. Andeen (MWF 1 p.m. class)

TA Orrin Shindell, oshindell@physics.utexas.edu, RLM 14.218

TA Michael Himmelsbach, mhimmelsbach@chaos.utexas.edu, RLM 14.312

LA Noor Al-Sayyad, nooralsayyad@utmail.utexas.edu

LA Kartik Chitturi, kartik.chitturi@gmail.com

AFTER EVERY CLASS: Members of the 303K teaching team will be available to answer questions in the hallway just outside the classroom.

OFFICE HOURS AND REVIEW SESSION SCHEDULE:

SUNDAY: 3-5 pm, RLM 4.102: Review session led by Orrin Shindell
>>> 5-7 pm, RLM 4.102: Homework problem session led by Michael Himmelsbach
(note: no session the night before a test)

MONDAY: 3-4 pm, RLM 10.208 (T. Andeen)

TUESDAY: 4-5 p.m., RLM 14.318 (Orrin Shindell)

WEDNESDAY: 9-10 a.m., RLM 14.318 (H. Swinney)

WEDNESDAY: 2-3 pm, RLM 10.208 (T. Andeen)

THURSDAY: 5-7 pm, JES-A303A (5-6 Michael Himmelsbach; 6-7 Noor Al-Sayyed)

FRIDAY: 11 a.m.-12 p.m., RLM 14.318 (H. Swinney)

FRIDAY: 2-4 p.m., RLM 14.318 (Kartik Chitturi)

SATURDAY: 4-5 p.m., RLM 7.116 (Noor Al-Sayyed)

SATURDAY on test weekends only: 5-7 pm, RLM 7.114 (Michael Himmelsbach)

>> There will be no office hours on Labor Day and Thanksgiving weekends <<

QUEST: Registration in UT QUEST is required for the homework, classwork, and tests:
<https://quest.cns.utexas.edu/student> After the 12th day of class, Quest will ask for a credit card payment. Address questions about fees to quest.fees@cns.utexas.edu

TEXTBOOK: *Matter and Interactions*, volume I, 3rd Edition (NOT 2nd and NOT 4th), by Chabay and Sherwood. The book is available from stores on Guadalupe and online.

Bookmark <http://matterandinteractions.org/Content/Articles/edition3.html> which has videos, lectures, and problems. Do NOT purchase the publisher's homework software WebAssign because we don't use it.

i>Clickers will be used for in-class response to questions, starting on Monday, August 29th. The basic i>Clicker and the i>Clicker-2 both work fine. i>Clickers are available new or used from many places online, and are available locally at the UT-coop and elsewhere.

>> i>clickers must be registered in canvas.utexas.edu

50% of the clicker grade for a class will be given if some response (right or wrong) is made for every clicker question. The remaining 50% of the clicker grade will be pro-rated by the number of correct answers to the questions. For example, if there are four clicker questions with a response given for all four questions but with only one correct response, the grade for the class is $62.5\% = [50\% + (1/4)50\%]$

HOMEWORK: Due by 11:30 p.m. in Quest on Thursday and Sunday, except Sunday evenings before a Monday evening test. Answers may be submitted one at a time up to the due time for the homework set. No homework will be accepted beyond the cutoff time.

TESTS: 7-9 p.m. in WEL 2.224 on Mondays Sept. 19, Oct. 10, Oct. 31, and Nov. 21. All four tests are required and are listed in the UT Course Schedule. NO makeup tests or alternative test times will be available.

For the tests you need only a pencil and an ID (UT or TDL). Put your backpack, coat, calculator, cell phone, all other electronic devices, etc. in the front of the classroom before taking a seat. Your assigned seat will have the test, Scantron answer sheet, formula sheet, and scrap paper.

SSD ACCOMMODATIONS:

Extra test taking time, etc: Students who have been granted extra time on tests by SSD must submit their Accommodations Letter to Prof. Swinney two weeks in advance of the test so that a proctor and quiet room can be arranged. See

<http://diversity.utexas.edu/disability/2016/08/important-ssd-fall-2016-updates/>

Religious holidays: A student who misses classes and examinations for the observance of a religious holy day should inform the instructor far in advance of the absence so that arrangements can be made to complete an assignment within a reasonable time after the absence.

FINAL EXAM: Wednesday, Dec. 14th, 9-12 noon.

GRADING: Semester grades will use the plus-minus grading scale. Grading:

- 5% Class clicker quizzes (4 drops)
- 4% Class written work (1 drop)
- 9% Homework (2 drops)
- 9% Discussion sessions (0 drops):
- 37% Tests (4 tests, 1 drop)
- 2% Written questions on Tests (4 tests, 1 drop)
- 34% Final Exam

> If one of the four Tests is missed, it will be the “dropped” test, unless the absence is excused where documentation is provided within one week attesting, for example, to a broken leg, hospitalization, car wreck, jail term. For an excused absence the final exam grade will be substituted for the missing test grade.

LABORATORY: The 103M lab is a separate course with a separate grade. The Laboratory begins Monday, August 29th.

COURSE CONTENT: This calculus-based introductory physics course uses the modern **Matter and Interactions** curriculum, which emphasizes the four fundamental

principles that form the basis of science and engineering: momentum, energy, angular momentum, and entropy. Frequent connections are made between the macroscopic and microscopic (e.g. gases as collections of colliding molecules, Einstein's model of a crystalline solid), demonstrating the universality of the fundamental principles. The course introduces concepts from quantum physics, including quantization (e.g. the quantized harmonic oscillator) and concepts from relativity, including Einstein's famous $E=mc^2$. In the classroom the instructor and teaching assistants will provide personalized guidance and interaction as students work together on clicker questions. The evening *Discussion Sessions* are an integral part of the course; these sessions emphasize the development of systematic problem solving techniques.

CLASS PREPARATION

- (1) Read the textbook assignment before class begins.
- (2) Bring your i-Clicker to every class.
- (3) Arrive for class in time to start promptly. Late arrivals and early departures are disruptive.

COACHING TABLES: Starting on Tuesday, September 6th, assistance with course material and homework will be provided by physics graduate students, 9-5 weekdays in RLM by the elevators on the 5th floor, which is one floor up from ground level (take the stairs or escalator because the elevator does not stop on the 5th floor).

ACADEMIC DISHONESTY: Using another person's clicker is an example of academic dishonesty that is a violation of the UT Honor Code

(http://deanofstudents.utexas.edu/sjs/spot_honorcode.php)

If a student is found to be using another student's clicker, the names of both students will be submitted to Student Judicial Services for appropriate action.

COURSE CORE COMPONENT: This course fulfills three hours of the Natural Science and Technology CORE component 030 or 031 of the university core curriculum and addresses the following four core objectives established by the Texas Higher Education Coordinating Board: (1) communication skills, (2) critical thinking skills, (3) teamwork, and (4) empirical and quantitative skills.

QUANTITATIVE REASONING FLAG. This course satisfies a U. Texas *Quantitative Reasoning Flag*: hence at least half of the course grade is based on the use of quantitative skills to understand the world with nuance and precision. The goal is for students to learn how to use logical, numerical, and/or statistical arguments and models and to understand the reasoning behind them.

QUEST homework answers: Use scientific notation, e.g. 3.569×10^{-10} , which means 3.569 times ten to the negative tenth power. The number -4375 can be written equivalently as -4.375×10^3 , or -4375, or -4375.000000

> Significant digits: Do not round off. Answers will be graded “correct” if they are within 1%, except for the answer zero, which must be exact. To be safe, use four digits, as in the examples above.

Physics 303K Syllabus - Fall 2016 Professors Swinney and Andeen, Matter & Interactions Book 3rd Edition

All homework is due by 11:30 pm on the date indicated above. Homework will be submitted via the Quest system

Date	Day	M-W Reading Assignment	Reading Topics	Homework and Test Numbers	Homework and Test Sections	Discussion
8/22/16	M	No Class				
	Tu					none
	W	1.1-1.4	Kinds of Matter; Detecting Interactions; Newton's First Law			
	Th			0	Math Review	
	F	1.5-1.7	3-D Vectors; SI Units; Velocity			
	Su			1	1.1-1.7	
8/29/16	M	Labor Day				
	Tu					1 - Assessment
	W	1.8-1.9, 2.1-2.2	Momentum; Changes in Momentum; Defining Systems; The Momentum Principle			
	Th			2	1.8-1.9, 2.1-2.5	
	F	2.3-2.5	Applying the Momentum Principle; Iterative Calculations; The Spring Force			
	Su			3	2.6-2.8; 2.11	
9/5/16	M	2.6-2.11, 4.10	Constant Force; Kinematic Equations of Motion (Differential Equations); Force and Mass			
	Tu					2 - Plotting
	W	3.1-3.5	Fundamental Forces; Gravitational Force; Reciprocity			
	Th			4		
	F	4.8, 4.13	Static and Kinetic Friction; Buoyancy and Pressure			
	Su			5		
9/12/16	M	3.6-3.10	Electric Force; Strong and Weak Forces; Chaos and Uncertainty			
	Tu					3 - Buoyancy
	W	3.11-3.15	Momentum Conservation; Multiparticle Systems			
	Th			6	3.6-3.15	
	F	Review				
	Su			Review for Test 1		
9/19/16	M	4.1-4.7, 4.9	The Atomic Basis of Material Properties: Tension, Young's Modulus	Test 1 - 7-9 pm	1.1-1.9, 2.1-2.8, 2.11, 3.1-3.13, 4.8, 4.13	
	Tu					4 - Car on incline
	W					
	Th			7	4.1-4.7, 4.9	
	F	5.1-5.6	Statics I: Systems at Rest; Curving Motion;			
	Su			8	5.1-5.4	
9/26/16	M	5.6-5.7	Circular Motion			
	Tu					5 - Circular motion
	W	6.1-6.3	The Energy Principle; Rest Energy; Kinetic Energy; Work			
	Th			9	5.4-5.7, 6.1, 6.2	
	F	6.3-6.7	Single Particle Energy Principle; Change in Rest Energy			
	Su			10	6.1-6.7	
10/3/16	M	4.11, 4.14-4.15	Simple Harmonic Motion (SHM): Amplitude, Frequency, Phase Angle, Graphs			
	Tu					6- GP Mass-Spring
	W	7.1, 7.3	Path Independence of Work; Potential Energy; Spring Energy			
	Th			11	7.1, 7.3, 4.11, 4.14-4.15	
	F	Review				
	Su			Review for Test 2		
10/10/16	M	7.2, 6.15	Interatomic Potential; The Universality of SHM: Taylor Expansion about a Minimum; Binding Energy	Test 2 - 7-9 pm	4.1-4.7, 4.9, 5.1-5.7, 6.1-6.7, 7.1, 7.3, 4.11, 4.14-4.15	
	Tu					7- Binding Energy

	W	6.8-6.9, 6.12-6.14	Gravitational and Electric Potential Energy			
	Th			12	7.2, 6.15, 6.8-6.9	
	F	6.10-6.11	Potential Energy Graphs			
	Su			13	6.10-6.14	
10/17/16	M	7.4-7.11	Heat; Heat Capacity; Power; Energy Accounting; Air Drag			8 - Ballistic Pendulum
	Tu					
	W	8.1-8.3	Photons; Electronic Energy Levels			
	Th			14	7.4-7.11	
	F	8.4-8.9	Vibrational and Rotational Energy Levels; Light; Laser			
	Su			15	8.1-8.9	
10/24/16	M	9.1-9.3, 9.8	Translational and Rotational Kinetic Energy and Center of Mass; Moment of Inertia			9 - Center of Mass and Inertia
	Tu					
	W	9.3-9.5	Moment of Inertia (Calculus); Point Particle and Real Systems			
	Th			16	9.1-9.5, 9.8	
	F	Review				
	Su			Review for Test 3		
10/31/16	M	10.1-10.5	Collisions in 1 dimension (1D)	Test 3 - 7-9pm	6.8-6.15, 7.2, 7.4-7.11, 8.1-8.9, 9.1-9.5, 9.8	10 - Collisions
	Tu					
	W	10.6 - 10.7	Collisions in 2-D and 3-D			
	Th			17	10.1-10.7	
	F	11.1-11.2	Angular Momentum			
	Su			18	11.1-11.2	
11/7/16	M	11.3-11.4	Angular Momentum Principle; Torque			11 - Angular Momentum
	Tu					
	W	11.7	Statics II: Systems at rest involving torques			
	Th			19	11.3-11.4, 11.7	
	F	11.5-11.6	Extended Bodies; The Three Principles of Mechanics			
	Su			20	11.5-11.6	
11/14/16	M	11.8-11.9	Rotational Dynamics			12 - Spool Dynamics
	Tu					
	W	11.10-11.11	The Bohr Atom; Spin; Gyroscopes			
	Th			21	11.8-11.11	
	F	Review				
	Su			Review for Test 4		
11/21/16	M	12.1-12.2	Introduction to Statistical Mechanics; The Einstein Model of Solids	Test 4 - 7-9pm		13 - Microstates
Thanksgiving Holiday	Tu					
	W-Th					
	Su			22	12.1-12.2	
11/28/16	M	12.3-12.4	Entropy; The Entropy Principle (The Second Law of Thermodynamics)			14 - Last Discussions
	Tu					
	W	12.5-12.8	Temperature; Heat Capacity; The Boltzmann Distribution			
	Th			23	12.3-12.8	
	F					
	Su					
12/5/16	M	1.1-12.8	Semester Review		11.1-11.11, 12.1-12.8	
5/13/16					1.1-13.4	