Physics 0174
Basic Physics for Students of Science and Engineering
Fall Term 2014 (2151)

Lecturer: Prof. Robert P. Devaty
211 Allen Hall
Phone: 412-624-9009
E-Mail: devaty@pitt.edu

Office Hours: 319 Allen Hall
Monday, 11:00 am – noon
Thursday, 11:00 am – noon
Friday, 11:00 am – noon

Recitation Instructors:

Lin Dai
Allen Hall 509, Desk #21
Phone: 412-624-7578
E-Mail: lid33@pitt.edu

Office Hours (517 Allen Hall):
Tuesday, 4:00 – 6:00 pm

Xiaowu Sun
Allen Hall 523, Desk #1
Phone: 412-624-7597
E-Mail: xis42@pitt.edu

Office Hours (517 Allen Hall):
Tuesday, 2:30 – 4:30 pm

Ryan Sayer
Allen Hall 200, Desk #14
Phone: 412-624-9096
E-Mail: rts36@pitt.edu

Office Hours (500 Allen Hall):
Tuesday, 12:00 – 1:00 pm
Friday, 1:00 – 2:00 pm

Undergraduate Teaching Assistants:

Tianyang Chen E-mail: tic27@pitt.edu
Hours: to be determined, ? Cathedral of Learning

Andrew Sassani E-mail: ajs237@pitt.edu
Hours: to be determined, ? Cathedral of Learning
to be determined, ? Cathedral of Learning

Text: **Fundamentals of Physics** (Extended Ninth Edition) by David Halliday, Robert Resnick and Jearl Walker, Chapters 1-20. Chapters 12, 14 and 18-20 are optional and will be covered as time permits. The Pitt book store sells a custom edition of the textbook, at a lower price than that of a new book purchased elsewhere. It is important to do the assigned reading **before** the associated lecture.

Lectures: The lectures are scheduled for 2:00 – 2:50 pm on Mondays and Fridays, 2:00 – 3:50 pm on Wednesdays in Room 343 Alumni Hall, with three important exceptions. The in-class exams will take place during regular lecture periods. Exam 1 on **Wednesday, October 1**, will take place in **Scaife Auditorium 6**. The lecture on Friday, October 6, will take place in **Scaife Auditorium 6**. The **Fall Break** is scheduled for Monday, October 13. Our regular Monday lecture will take place on **Tuesday, October 14**, that week. Your regular Tuesday classes will not meet on October 14. The lectures will include class participation via a student response system (clickers) as well as frequent demonstrations of the concepts under discussion. Your responses via the clickers will contribute towards your grade.

Homework: Homework will be assigned using the LON-CAPA on-line system. Typically, homework problems will be due weekly, at 11:59 pm on the chosen day. It is your responsibility to do the homework before the recitation section as preparation for the weekly quizzes. The ability to understand and solve problems is essential for successful performance on the

quizzes and exams. Your homework score, automatically compiled by LON-CAPA, will contribute to your grade.

To access LON-CAPA go to: http://homework.phyast.pitt.edu Your **username** is your Pitt e-mail username. Your default **password** is your PeopleSoft number (which you can find at my.pitt.edu). You should change your password upon first use. If you have used LON-CAPA before, your password should remain as you left it. If you have trouble logging in (your PeopleSoft number doesn't work, you forgot your old password, etc.) click on "Forgot Password?" on the login screen and follow the instructions there. To find assignments, click on "course content" or "navigate content" at the top of the page. Be sure to click "submit answer" when you enter an answer. Otherwise, your answer will not be recorded.

Recitation: Your recitation section provides the opportunity to ask questions and discuss the material in a smaller group. You will also benefit from the alternative viewpoint of the recitation instructor. The intended format for the recitation is:

- Quick review of recent material (5-10 minutes)
- Questions / discussion / problem solving (25-30 minutes) It is highly desirable that most of the recitation period be used for active learning. For example, the recitation instructor can break up the group into smaller groups to do work sheets or guided problems, or ask students to work out problems on the board.
- Weekly quiz (10-15 minutes), which will contribute to your grade.

Your recitation grade will be based on the quizzes.

Courseweb Site: There is a Courseweb site associated with this course. It can be accessed through your http://my.pitt.edu account. This site will be used to make important announcements and to make materials available such as lecture slides, exam solutions, announcements, tutorials, etc. My tendency is to place everything under "Course Documents". As mentioned earlier, homework will be handled on-line using LON-CAPA.

Examinations: There will be two preliminary examinations, given during regular lecture periods. The scheduled dates are October 1 (Wednesday) and November 14 (Friday). The locations of these exams are given above. The comprehensive final examination is scheduled by the University for Monday, December 8, from 2:00 – 3:50 pm.

Grading: Each preliminary examination will be worth 100 points. The final examination will be worth approximately 150 points. The weekly quizzes will be worth 70 points, the LON-CAPA homework will contribute 60 points, and lecture participation (clickers) will contribute 20 points. Some (perhaps two or three) of your lowest quiz scores will be dropped. The total number of points for the course will be 500. Your score out of 500 will be converted into a letter grade. The departmental guideline for the total number of grades A+ through B- will be followed. The guideline is intended to ensure uniformity and fairness among different sections of the same course with different instructors. There may be some opportunities to earn extra credit points, including activities in the Physics Exploration Center (312 Thaw Hall, adjacent to the Resource Room) and making use of the undergraduate teaching assistants. Details will be provided in lecture.

Help: There are many resources available for help in addition to the regular office hours of the instructor and teaching assistants. These include:

- Resource Room, 312 Thaw Hall: This room is staffed by graduate student teaching assistants of the introductory physics and astronomy courses. The hours will be posted on the departmental

website. An announcement will be made in lecture once scheduling is complete. Click on "Resource Room" at the link http://www.physicsandastronomy.pitt.edu/about/resources .

- Academic Resource Center, G1 Gardner Steel Conference Center (next to Thackeray Hall, across the street from Benedum): This free tutoring service is available to all students enrolled in Physics 0174 and 0175 (among other courses). The center is open Monday through Friday from 9 am to 4 pm. Tutoring sessions are generally one hour long. Students are encouraged to make an appointment in advance by calling 412-648-7920.
- If you wish to hire a private tutor, contact the Physics departmental office, 100 Allen Hall.

Academic Integrity:

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and **programmable calculators**.

Disabilities:

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu , (412)228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Assignment for Week 1:

Reading: Halliday, Resnick and Walker, Chapters 1 and 2
Homework: Log on to LON-CAPA

Physics 0174, 2151 (Fall 2014)
Weekly Topics (Approximate Schedule)
R.P. Devaty

Week	Lecture Date	Chapter	
1	Aug 25 (M)	1	Lect 1: organizational details, course overview and teaching philosophy; the nature of physics; systems of units; changing units; dimensional analysis; measurement uncertainty and significant figures; scientific notation
	Aug 27 (W)	2	Lect 2: motion in one dimension: variables used to describe motion - position, displacement, velocity, and acceleration; motion diagrams; illustrations; mathematical description of 1-D motion – kinematic equations for constant acceleration
	Aug 29 (F)	2	Lect 3: free fall and other examples; use of graphs
2	**Sep 1 (M)**		**Labor Day – no lecture**
	Sep 3 (W)	3	Lect 4: mathematical tools - trigonometric functions; scalars and vectors; vector addition and subtraction; illustrative examples; multiplying vectors (scalar and cross products); vector components; unit vectors
	Sep 5 (F)	4	Lect 5: vector kinematic quantities; generalization to motion in two and three dimensions
3	Sep 8 (M)		Lect 6: examples of 2-D motion: projectiles and objects in uniform circular motion
	Sep 10 (W)		Lect 7: relative velocity methodical approach to solving motion problems; illustrative examples
	Sep 12 (F)	5	Lect 8: inertia and mass; inertial frames of reference; forces – definition; common types of forces (weight, normal force, tension, frictional force); identifying the forces acting on an object; free-body force diagrams; finding the net force
4	Sep 15 (M)	5	Lect 9: relationship between net force and motion: Newton's Three Laws applications of Newton's Laws - illustrative examples of particles in equilibrium and particle dynamics
	Sep 17 (W)	6	Lect 10: applications of Newton's Laws; choosing a coordinate system and decomposing forces; determining the magnitude and direction of the frictional force;
	Sep 19 (F)	6	Lect 11: application of Newton's Laws: illustrative examples; dynamics of circular motion; centripetal forces; interaction forces and Newton's Third Law; approaches to solving problems that involve coupled objects
5	Sep 22 (M)	7	Lect 12: scalar product; the concepts of work and kinetic energy; definition of work as dot product of force and displacement vectors; illustrative examples: gravity, ideal spring
	Sep 24 (W)	7	Lect 13: work-energy theorem; work done by a variable force; power – the rate of doing work; pre-examination review
	Sep 26 (F)	8	Lect 14: potential energy; transformation of energy from one type into another; illustrations; gravitational potential energy and elastic potential energy
6	Sep 29 (M)	8	Lect 15: conservative and non-conservative forces; force and potential energy

	Oct 01 (W)		**1st hour-examination (material since start of course)**
	Oct 03 (F)	8	Lect 16: Law of Conservation of Total Mechanical Energy - what does it mean and when does it apply? How to take advantage of it in solving problems? illustrative examples; potential energy diagrams
7	Oct 6 (M)	9	Lect 17: the concepts of impulse and linear momentum; the impulse-momentum theorem;
	Oct 8 (W)	9	Lect 18: the conservation of linear momentum law: when does it apply? Illustrative examples
	Oct 10 (F)	9	Lect 19: application to collision problems; elastic vs. inelastic collisions; the concept of center of mass
8	**Oct 14 (T)**	10	Lect 20: rotation of rigid bodies: angular displacement, angular velocity, and angular acceleration; examples of rigid body rotations; relationships between linear and angular kinematic variables; rolling motion
	Oct 15 (W)	10	Lect 21: rotational kinetic energy; rotations with constant angular acceleration; illustrative examples; the concept of moment of inertia; examples of calculating the moment of inertia for objects of different shapes; the Parallel Axis Theorem
	Oct 17 (F)	11	Lect 22: dynamics of rotational motion: the concept of torque; Newton's Second Law for rotational motion; illustrative examples
9	Oct 20 (M)	11	Lect 23: work and power in rotational motion; definition of angular momentum; the conservation of angular momentum law and when it applies; examples
	Oct 22 (W)	11, 12	Lect 24: conditions for equilibrium; examples of rigid-body equilibrium problems
	Oct 24 (F)	13	Lect 25: Newton's Law of Gravitation; weight vs mass; gravitational potential energy
10	Oct 27 (M)	13	Lect 26: applications of Newton's Law of Gravitation – the motion of satellites and planets
	Oct 29 (W)	13, 15	Lect 27: Kepler's Laws and the motion of the Earth's planets; periodic motion and simple harmonic motion: the equations used to describe SHM; example: mass on a spring
	Oct 31 (F)	15	Lect 28: conservation of total mechanical energy for simple harmonic motion; simple pendulum
11	Nov 3 (M)	15	Lect 29: periodic motion (continued) - the physical pendulum; torsional pendulum; damped oscillations; forced oscillations and resonance phenomena
	Nov 05 (W)	16	Lect 30: mechanical waves – transverse vs longitudinal waves; mathematical description of a wave; speed of a transverse wave; waves on strings and sound waves; energy transmitted in wave motion
	Nov 7 (F)	16	Lect 31: the principle of superposition; wave interference; standing waves; normal modes of a string; resonance; examples
12	Nov 10 (M)	17	Lect 32: sound waves – generation, transmission, reception; speed of sound
	Nov 12 (W)	17	Lect 33: sound intensity; interference patterns; beat frequency; the Doppler effect
	Nov 14 (F)		**2nd hour-examination (material since 1st examination)**

13	Nov 17 (M)	18	Lect 34: temperature and thermal equilibrium; Zeroth Law of Thermodynamics; thermometry; temperature scales; thermal expansion (optional); definition of heat; heat capacity; specific; heat of transformation (phase changes)
	Nov 19 (W)	18	Lect 35: calorimetry; heat and work; First Law of Thermodynamics; applications; heat transfer: conduction, convection, radiation (optional)
	Nov 21 (F)	19	Lect 36:Avogadro's number; ideal gas (equation of state, thermodynamic processes); kinetic theory (kinetic-molecular model of an ideal gas); rms speed; relationship between molecular kinetic energy and temperature
14	Nov 24 (M)	19	Lect 37: mean free path (optional); molar specific heat for an ideal gas at constant volume and at constant pressure; equipartition of energy; degrees of freedom
	Nov 26 (W)		**Thanksgiving Break – no lecture**
	Nov 28 (F)		**Thanksgiving Break – no lecture**
15	Dec 1 (M)	19, 20	Lect 38: adiabatic expansion; free expansion; entropy; irreversible processes
	Dec 3 (W)	20	Lect 39: Second Law of Thermodynamics; thermodynamic engines; Carnot efficiency; refrigerators; statistical view of entropy; Third Law of Thermodynamics
	Dec 5 (F)		Lect 40: pre-final examination review of course material

Week #16	**Dec 8 (Monday) 2:00–3:50 pm (place to be announced)**	**Final Examination (all material covered in the course)**

Note: The schedule is an outline only. Wednesday lectures are twice as long, so a larger number of topics is listed. It is likely that we will fall behind this ambitious schedule. The material on thermal physics is optional; some or all of it might not be covered if we fall behind.