PHYSICS OF TECHNOLOGY – PHYS 1800

Spring Semester 2016

Course: Designed for non-physics majors (4 credits).

Goal: To help you develop a good understanding of everyday physics, i.e. the world around us.

Help you develop an enjoyment in understanding and explaining everyday phenomena.

Not aimed at simply accumulating a bunch of facts!

You will discover- that learning to develop your own physical explanations will be most gratifying and will give you a much better appreciation of nature.

Class: Mon, Wed, Fri, 10:30-11:20 am, **MAIN Room 326**

Instructor: Dr. Mike J. Taylor, SER Bld. 220C, Tel: 797-3919, e-mail: mike.taylor@usu.edu

Office Hours: After class Mon, Wed, Fri, 11:30am -12:30pm (or open door…)

Laboratory Demonstrations: Tue 3:00-4:15 pm, **ESLC Room 130** (see syllabus)

Recitation: Thur 1:30-2:45 pm, **WIDT Room 007**

Class Assistant: Jonathan Pugmire, e-mail: jon.pugmire@aggiemail.usu.edu

Prerequisites: Algebra (Math 1050) and Trigonometry (Math 1060).

Objectives:

This course provides a **conceptual introduction** to physics with the primary goals of gaining knowledge and intuition into every day phenomena using well-developed physical principles and to acquire basic problem solving skills.

Text:

W. Thomas Griffith, ***The Physics of Everyday Phenomena, A Conceptual Introduction to Physics,*** McGraw Hill, **REQUIRED.** The most recent edition is the 7th Edition, but **you can purchase a used earlier version (back to 3rd edition) to minimize costs** as no associated CD is needed for this course.

Course Fee: A $10 fee is used to upkeep the demonstration equipment used in this class.

Disability Note: Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, (435)797-2444 voice, (435)797-0740 TTY, (435)797-2444 VP, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.

Honor Code: The honor code will be strictly enforced in this course. Any suspected violations of the honor code will be promptly reported to the honor system. Policies regarding the honor code will be enforced and can be found at: http://www.usu.edu/policies/PDF/Acad-Integrity.pdf

COURSE ACTIVITIES:

Lectures (MAIN 326):

- Will focus on basic physical concepts and their application in our every day world.
- To better assist the student they will follow and augment the textbook development but will not cover all the text material in detail.
- The student is advised to **read the text** (as indicated in the attached Syllabus breakdown) **prior** to coming to each lecture to be more familiar with the topics discussed.
- Your scores and lecture notes will be made available on the university **Canvas system.**

Laboratory demonstrations (ESLC 130): Note change in time!

- To aid your understanding of the physical concepts a series of **12 laboratory demonstration classes** will be given mainly of **Tuesdays (3:00-4:15 pm),** see Syllabus attached for full details. These demonstrations are **an integral part of the course** and over 100 experiments will be performed during the semester helping illustrate the physical principles discussed in the lectures. They are highly informative and will significantly help you develop a clear understanding of the physical principles.
- **No direct credit** is given for attending these demonstration labs, but the homeworks and the test questions will often draw upon these experiments. The lab demonstrations are great fun and **you are strongly advised to attend them.**

Recitation (WIDT 007)

- A recitation class will be given on most **Thursdays** (1:30-2:45 pm). They are designed to **review and reinforce** the material presented in the lectures and in the textbook and will act as a forum for developing your problem solving skills.
- Recitation classes also provide an excellent opportunity for you to discuss any problems with your **homework** and for **test review** preparations.

Homework:

- Assignment problems based on the class and laboratory material will be given out weekly at the **Friday class** and should be returned at the beginning of class on the **following Friday** (see Syllabus for exact schedule).
- **You are encouraged to discuss your homework assignments with others and to work together solving the problems**. However, it is a violation of USU rules to simply copy someone else's homework! Your homework must be in your own words and **MUST NOT** duplicate the work of other students. Homework is important for test preparations.

HOMEWORK FORMAT AND GRADING:

- There will be **14 homeworks,** each of which will consist of several short answer questions as well as some basic problems to solve.
- **Your top 12 homework scores will be counted in your grade** (i.e. drop 2 lowest scores). Homework must be handed in on time.
- **No credit** will be given for **late homework**; it will be counted as one of the **two scores** that are dropped.
- Each homework is worth up to **20 points.** (Note, to get full credit for a problem you must **show all your workings** and make a reasonable attempt to solve it.)
- An additional **bonus question** will be given out with each homework assignment. These are more challenging (but quite doable) problems that are intended to expand your physics comprehension and problem solving skills.
- These bonus questions are **optional** and must be handed in with your homework. You may receive an additional score of typically **5 extra points** for the optional question.

CLASS GRADING (Total 1000 points):

Your final grade will be based on your cumulative homework scores, four test scores, Lab class participation, and a small project, as described below:

Homework (240 points) Total 24%:

This is an essential part of your studies and is **key** to doing well in the class. A large fraction of the test questions will be based on the homework and laboratory problems.

In-Class Tests (180 points - 18% each) Total 54%

There are three in-class tests. These will be scheduled during class period (see attached Syllabus for exact details). Each test will be **closed-book** and will be based on the recent topics covered in class and on the **homewor**k and **laboratory demonstrations**. Each test will consist of a number of multiple choice questions, short answer questions and some basic numerical problems. **A list of relevant equations will be provided**.

Final Test (180 points) Total 18%

The final test is **not cumulative** and will follow the same format of the previous 3 tests.

Build an Instrument Project (40 points) Total 4% (bonus up to 10%):

As part of this class you will build an electric motor or other approved instrument. This is an interesting "hands on" project. To obtain the full 40 points you will need to **demonstrate its successful operation and provide a short ½ page description of its operation.** Each machine will be demonstrated on the **last day of classes.** Additional points (up to a project **maximum of 100)** may be given as extra credit for creativity, time and effort, and overall **"awesomeness"of your machine!** Your final score will be determined "on the spot" by the instructor and in-class voting.

Make-Up Exams:

- These will **not** be given unless you have compelling reasons (see instructor well beforehand), or illness in which case a Doctor's letter may be required.

ABOUT THE TEXT:

The Physics of Everyday Phenomena (3^{rd} editions or later) provides a clear explanation of each physics topic that we will cover: first in words and then using simple examples employing basic math and formulas. The text is divided into six general units:

1. **Motion** – Newton's laws, linear and circular motion, energy.
2. **Fluids and Heat**- Behavior of fluids, heat flow, engines.
3. **Electricity and Magnetism**- electrostatics, magnetic fields, generators, motors etc.
4. **Waves and Optics**- Properties of waves, light, lenses, telescopes.
5. **Atomic and Nuclear**- Atoms, radioactivity, nuclear reactions.
6. **Relativity**- Einstein's theories, cosmology.

This course will focus on the **first 4 units** (Chapters 2-17) which concern major ideas in **Classical Physics** (our everyday life). However, if time permits some key points of **Modern Physics** (Chapters 18 and 19) will be covered at the end.

Each chapter is divided into several separate sections and concludes with a well-developed summary of the most important points. Each chapter also has a list of:

-Conceptual questions- aimed at developing basic concepts of the phenomena.

-Numerical questions- aimed at developing skills in problem solving using basic algebra.

-Home experiments- many of which we will perform in the laboratory demonstration classes.

WHERE TO GET HELP:

If you find yourself confused on a particular topic or if you are spending **more than 10-15 min on any given homework problem** you should:

1. Review the relevant chapter and look over their example problems.

2. Try to solve a similar problem. (The solutions to odd numbered problems are given in the back of the textbook.)

3. Make sure you **attend the Recitation Class.** Don't be afraid to ask questions in the class and be prepared to show your work and explain where the problem arises. This will lead to a better understanding for you and will result in a positive discussion for the whole class too.

4. Talk with other colleagues in your class. Ask them to explain things to you (rather than solving the problem for you).

5. Seek additional help from the **Class Instructor** (Dr. Mike Taylor), the **Assistant Instructor** Jon Pugmire) preferably during designated office hours (but other times as we are available).

Date	Day	Lecture / Labs	Chapter	Homework Due
Jan 11	M 1	1. Class Admin, Units, Scalars, Vectors	1& App. B, C	
12	Tu	*Lab #1: Linear Motion & Motion Under "g"*	2-3	
13	W	*2.* Speed, Velocity, Acceleration	2	-
14	Th	*Recitation: Units, Scalars, Vectors*	2	
15	F	3. Equations of Linear Motion	2	
Jan 18	M 2	***Martin Luther King Day***	***No Class***	
19	Tu	*Review: Practical examples linear motion*	2-3	
20	W	4. Free Falling Objects	3	
21	Th	*Recitation*	2-3	
22	F	5. Projectile Motions	3	#1
Jan 25	M 3	6. Newton's 1st and 2nd Laws	4	
26	Tu	*Lab #2: Forces & Newton's Laws*	4	
27	W	*7.* Newton's 3rd Law, Mass and Weight	4	
28	Th	*Recitation*	3-4	
29	F	8.Everday Motion with Friction	4	#2
Feb 1	M 4	**In-class-Review**	1-4	
2	**Tu**	**TEST# 1 (ESLC 130; 3:00-4:15 pm)**	**1-4**	
3	W	9. Introduction to Circular Motion	5	
4	Th	*Recitation*	4-5	
5	F	10. Kepler's 3 Laws and Planet Motions	5	#3
Feb 8	M 5	11. Newton's Gravity Law and Orbits	5	
9	Tu	*Lab # 3: Circular Motions*	5	
10	W	12. Orbits, Seasons and Eclipses	5	
11	Th	*Recitation*	5	
12	F	13. Energy and Work	6	#4
Feb 15	M 6	***Presidents Day***	***No Class***	
16	Tu	14. Conservation of Energy, SHM 14.	6 (Monday class)	
17	W	15. Impulse and Momentum	7	
18	Th	*Lab #4: Energy and Collisions / Recitation*	7	
19	F	16. Conservation of Momentum & Recoil	7	#5
Feb 22	M 7	17. Solid Rotational Motion & Equations	8	
23	Tu	*Lab #5: Solid Rotational Motion*	8	
24	W	18. Torque and Rotation	8	
25	Th	*Recitation*	7-8	
Feb 26	F	19. Conservation of Angular Momentum	8	#6
Feb 29	M 8	**In-Class Review**	5-8	
Mar 1	**Tu**	**TEST #2 (ESLC 130; 3:00-4:15 pm)**	**5-8**	
2	W	20. Static Fluids, Pressure	9	
3	Th	*Recitation*	8-9	
4	F	21. Buoyancy & Flotation	9	#7
Mar 7-11	M-F	***Spring Break***	***No Classes***	
Mar 14	M 9	22. Fluids in Motion	9	
15	Tu	*Lab #6: Fluids*	9	
16	W	23. Temperature and Heat	10	
17	Th	*Recitation*	10	
18	F	24. First Law of Thermodynamics	10	#8
Mar 21	M 10	25. Change of State, Latent Heat	10	
22	Tu	*Lab #7: Temperature and Heat Transfer*	10	
23	W	26. Heat flow and Greenhouse Effect	10	
24	Th	*Recitation*	10	
25	F	27.Heat Engines	11	#9
Mar 28	M 11	28. Power and Refrigeration	11	
29	Tu	*Lab # 8: Heat Engines and Pumps*	11	

30	W	29. Charge and Electrostatics	12	
31	Th	*Recitation*	11-12	
Apr 1	F	30. Electric Fields and Forces	12	#10
Apr 4	M 12	31. Electric Potential and Lightning	12	
5	Tu	*Lab #9: Electrostatic Phenomena*	12	
6	W	**In-Class review**	9-12	
7	**Th**	**TEST #3 (WIDT 007; 1:30-2:45 pm)**	**9-12**	
8	F	32. Magnets and Magnetic Force	14	#11
Apr 11	M 13	33. Electromagnetism	14	
12	Tu	*Lab #10:Electromagnetism*	14	
13	W	34. Principles of Electric Motors	14	
14	Th	*Recitation*	14	
15	F	35. Faraday's Law and Electricity	14	#12
Apr 18	M 14	36.Propagating and Standing Waves	15	
19	Tu	*Lab #11: Waves, Sound and Doppler Effect*	15-16	
20	W	37. E-M Waves Spectrum and Color	16	
21	Th	*Recitation*	15-16	
22	F	38. Light and Reflections	17	#13
Apr 25	M 15	39. Refraction of Light and Lenses	17	No test week
26	Tu	*Lab #12: Optics*	17	
27	W	40. Forming Images and Telescopes	17	
28	**Th**	**Review and recitation**	**14-17**	
29	**F**	**Student Project Demonstrations**	-	#14
May 2	**M**	**FINAL TEST: 09:30-11:20am**	**MAIN 326**	

Grading Structure:

> 92.5	A
90.0 - 92.5	A -
87.5 - 90.0	B +
82.5 - 87.5	B
80.0 - 82.5	B -
77.5 - 80.0	C+
72.5 - 77.5	C
70.0 - 72.5	C -
67.5 - 70.0	D+
60.0 - 67.5	D
<60.0	F