

ENGR/PHYS 216 – SPRING 2020

EXPERIMENTAL PHYSICS AND ENGINEERING LAB II – MECHANICS

ENGR/PHYS 216 section(s) 204, 409, 509 - MONDAY LECTURE, WEDNESDAY LAB

ENGR/PHYS 216 section(s) 411, 412, 510, 511, 512 - TUESDAY LECTURE, THURSDAY LAB

ENGR/PHYS 216 section(s) 207, 208 - WEDNESDAY LECTURE, FRIDAY LAB

INSTRUCTOR INFORMATION:

Dr. Natela Ostrovskaya, Senior Lecture, Department of Nuclear Engineering

Email: natela@tamu.edu

Office hours (held in 424 ZACH): MW 10:30 pm – 11:30 am, or by appointment (please, get in touch with me via email).

Catalog Description: Description and application of laws of physical motion to the solution of science and engineering problems; using sensing, control and actuation for the experimental verification of physics concepts while solving engineering problems.

Prerequisites: C or better in MATH 151 or MATH 171 or equivalent; C or better in ENGR 102, grade of C or better or concurrent enrollment in PHYS 206.

The second laboratory course in the freshman sequence focuses on the description and application of the laws of physical motion to the solution of science and engineering problems. During bi-weekly projects students are introduced to a variety of sensors, their basic calibration, and will program the computer-based data-acquisition and control framework. Using sensing, control and actuation these lab projects target experimental verification of the physics concepts while solving direct engineering problems.

Course Expectations:

You are expected to:

- **Always use your @tamu.edu e-mail account to send correspondence between yourself and the teaching team. Always include your section number in the subject line for all correspondence. Check your @tamu.edu email account daily.**
- Use your eCampus account (<http://ecampus.tamu.edu/>) to access course information, assignments and your grades.
- Be an active problem solver, contributor, and discussant in lecture and lab.
- Be prepared and accountable for both lecture and lab by reading the assigned material ahead of time and be able to answer simple questions over said material.
- Be held accountable for all assigned material that is, or is not, explicitly discussed in class.
- Have a public presence in the class.
- Attend class as a community expectation.

Learning Objectives:

Conceptual knowledge to gain:

- Understanding the role of the physical laws of motion, static and dynamical Newtonian mechanics to engineering applications.
- Usage of sensors, data-acquisition frameworks, and logic programming to solve specific engineering applications.

Mode of Instruction:

There are 7 labs and 14 lectures in this course. Lectures meet weekly for one hour in their assigned room. Labs meet in the Engineering Foundations Lab (ZACH 398) at their assigned time. Because there are 7 labs and 14 weeks in the term, most labs have two weeks devoted to them.

Lectures will cover topics including (but not restricted to) material needed for understanding the labs, applications of mechanics to engineering topics, engineering ethics, and art in engineering.

The lab component of the course is at its core composed of a set of mostly biweekly units. Each unit targets different engineering application of physics concepts. Each unit takes about 6 contact hours for completion and have the following rough structure:

- **Proof of concept:** beginning with a very simply experiment (under one hour of duration) demonstrating the underlying physics concept in the most clear and concise way, without distractors such as complicated data-acquisition equipment that may initially interfere with the understanding of the concept. This part is to guarantee the student is familiar with the theoretical principle at the most basic level before attempting to create a much more complex project using this concept.
- **Project:** the bulk of the remaining time is used to initiate a team project for a specific engineering application that uses such physics concept. In this step the usage of any data-acquisition equipment, programming tools, and analysis software is strongly emphasized to give the students the familiarization to the tools and methods used in engineering applications.
- **Lab Report:** students will present their lab results and methods in a lab report. Details on what is expected in lab reports will be provided.

The projects are not intended to be independent, but rather build in knowledge upon the previous projects and concepts. At the end of the semester the students need to be able to carry more complex projects and be familiarized with most of the tools and components used in engineering applications.

Textbook and/or Resource Material

Lab Manual: ENGR 216/PHYS 216 Lab Handouts. All lab handouts (instructions, etc.) will be available on the course eCampus site.

You will also need the PHYS 206 textbook - University Physics (Volume 1) by Young and Freedman, 14th ed., with Modern Physics for Modified Mastering. ISBN13: 9781323128596. Since this is a required book for PHYS 206, you should have purchased

it for that course. (Note: any text used for a course equivalent to PHYS 206 is acceptable.)

Students are required to have a laptop computer that meets the specifications of the College of Engineering (see [BYOD specifications](#)). If your laptop does not have an RJ45 Ethernet port, you will have to purchase a USB-to-RJ45 adapter.

Course Assignments and Grading Policies

- Lab assignments (58%) – There are 7 lab assignments over the course of the term. Labs 2 through 7 are each worth 9% of your grade. Lab 1 is worth 4% of your grade. Labs will be done in teams of 3 to 4 students.
 - Lab assignments late up to one week will have their grade scaled by 70%. Labs may not be submitted more than one week late without permission of the instructor/course director.
- Classwork and homework (20%) – There will be classwork and homework associated with the 14 lectures in the course.
- Industry Night and Department Information Saturday (2%) – You will be required to attend 1 Industry Night Seminar during the term. You will be required to attend 2 Department Information Presentations on Saturday, April 4th. For all of these events you will need to submit a short (250 word) essay indicated you attended and paid attention. More details on Industry Nights and DI Saturday will be forthcoming.
- Final Exam (20%) – There will be a final exam on the course material during the finals period.

The following grading scale will be used to determine your semester course grade:

$$100 \geq A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F$$

Other Pertinent Course Information

Computer Languages: Work in this course will build on your knowledge of Python 3.X gained in ENGR 102. You will be expected to write/modify Python scripts to acquire and analyze data using both your own computer and the lab computer. The lab computer uses the Linux operating system, and basic instruction on this OS will be provided.

Department Information Saturday: As part of the College's effort to inform students about the different departments, students in ENGR 216 are required to attend Department Information Saturday on **APRIL 4**. Students will have to attend two (2) one-hour presentations by two different departments (one from the Maroon group and one from the White group), and turn in two short (250 word) essays on the presentations. The two departments whose presentations you attend should be different than the department presentations you attended for ENGR 102. More details on this assignment will be posted on eCampus.

Lab submission rules: IMPORTANT The labs in this course are designed to be done as a team, and submitted as a team. While it is understood that different team members will have different skill sets, it is expected that all team members will contribute to the lab and lab report equally, in their own way.

This expectation leads to two rules:

1. If you do not participate in a lab with your team, do not put your name on the lab report.
2. If a team member does not participate with his/her team in a lab, the rest of the team should not (as a favor) put his/her name on the lab report.

Violation of either of these rules will yield a grade of zero for that lab for the offending party or parties (yes, your entire team can get a zero for a lab if you add someone who shouldn't be on the lab report.)

As stated above, participation can mean many different things. At a minimum, however, participation must include attendance at the first lab of a two-week lab set.

If you miss this initial lab period, you will have to do the lab on your own in the second lab of the two-week set, and submit your lab report independently. If you miss both lab periods of a two-week set, and do not have a university approved absence for the lab, you will not be able to make up the lab. Make-up labs for students with university approved absences for both meetings of a two-week lab set will be done at a time set by the lab manager, and may be in the evening (since that is the only time the lab may be free.)

Lab Safety: For your safety and the safety of other people in the laboratory, the following rules must be followed.

1. Long pants and closed-toe shoes must be worn at all times.
2. No loose clothing or loose jewelry should be worn. Long hair should be tied back. (This is to avoid potential entanglement with the moving parts of the air table.)
3. Pay attention to the amperage and voltage limits listed in the labs when using electronic equipment. (This is to avoid potential shock-hazards.)

You will not be allowed in the lab if you do not follow these rules.

Class Meetings (class activity, day, time, and location by section)

ENGR/PHYS 216 section(s) 204, 409, 509

MONDAY LECTURE, WEDNESDAY LAB

ENGR	216	204	Lecture	M	09:10 am-10:00 am	ZACH 248
			Lab	W	08:00 am-10:50 am	ZACH 398B
PHYS	216	204	Lecture	M	12:40 pm-01:30 pm	ZACH 248
			Lab	W	11:00 am-01:50 pm	ZACH 398B
ENGR	216	409, 509	Lecture	M	04:10 pm-05:00 pm	ZACH 353
			Lab	W	02:00 pm-04:50 pm	ZACH 398D
PHYS	216	509	Lecture	M	04:10 pm-05:00 pm	ZACH 353
			Lab	W	02:00 pm-04:50 pm	ZACH 398E

ENGR/PHYS 216 section(s) 411, 412, 510, 511, 512

TUESDAY LECTURE, THURSDAY LAB

ENGR	216	510	Lecture	T	09:35 am-10:25 am	ZACH 353
			Lab	R	09:00 am-11:50 am	ZACH 398D
ENGR	216	411, 511	Lecture	T	12:45 pm-01:35 pm	ZACH 353
			Lab	R	12:10 pm-03:00 pm	ZACH 398D
PHYS	216	511	Lecture	T	12:45 pm-01:35 pm	ZACH 353
			Lab	R	12:10 pm-03:00 pm	ZACH 398E
ENGR	216	412, 512	Lecture	T	03:20 pm-04:10 pm	ZACH 353
			Lab	R	03:20 pm-06:10 pm	ZACH 398D
PHYS	216	512	Lecture	T	03:20 pm-04:10 pm	ZACH 353
			Lab	R	03:20 pm-06:10 pm	ZACH 398E

ENGR/PHYS 216 section(s) 207, 208

WEDNESDAY LECTURE, FRIDAY LAB

PHYS	216	207	Lecture	W	09:10 am-10:00 am	ZACH 248
			Lab	F	09:00 am-11:50 am	ZACH 398B
ENGR	216	208	Lecture	W	12:40 pm-01:30 pm	ZACH 248
			Lab	F	12:10 pm-03:00 pm	ZACH 398B

Course Topics, Calendar of Activities*, Major Assignment Dates

IMPORTANT: Because of holidays which occur during the term, schedules will vary among sections. Pay attention to the instructions given by your instructor.

ENGR/PHYS 216 section(s) 204, 409, 509

MONDAY LECTURE, WEDNESDAY LAB

Meeting	Date	Topic	Work Due
1	M 1/13	Lecture 1: Introduction, Propagation of Error	
2	W 1/15	No Lab 1 st week	
	M 1/20	NO CLASS (MLK day)	
3	W 1/22	Lab 1: Introduction to the Air Table	Teams Assigned
4	M 1/27	Lecture 2: Finite differences	HW 1
5	W 1/29	Lab 2: Visual Odometry	Lab 1 report
6	M 2/3	Lecture 3: Intro to Excel	
7	W 2/5	Lab 2, take 2	
8	M 2/10	Lecture 4: Basic Experimental Statistics	HW 2
9	W 2/12	Lab 3: Motion Control	Lab 2 report
10	M 2/17	Lecture 5: Confidence Intervals	
11	W 2/19	Lab 3, take 2	
12	M 2/24	Lecture 6: UAE	HW 3
13	W 2/26	Lab 4: Force Evaluation	Lab 3 report
14	M 3/2	Lecture 7: Particle Statics	
15	W 3/4	Lab 4, take 2	
		SPRING BREAK	
16	M 3/16	Lecture 8: Conservation of Momentum analysis (Collisions)	HW 4
17	W 3/18	Lab 5: Collisions	Lab 4 report
18	M 3/23	Lecture 9: Rigid Body Statics	
19	W 3/25	Lab 5, take 2	
20	M 3/30	Lecture 10: Center of Mass and Angular Momentum	HW 5
21	W 4/1	Lab 6: Rotational Motion	Lab 5 report
	Sat 4/4	DI Saturday (required)	
22	M 4/6	Lecture 11: Harmonic Motion	
23	W 4/8	Lab 6, take 2	
24	M 4/13	Lecture 12: Engineering Ethics (1)	HW 6
25	W 4/15	Lab 7: Harmonic Motion	Lab 6 report
26	M 4/20	Lecture 13: Engineering Ethics (2)	
27	W 4/22	NO LAB	Lab 7 report
28	M 4/27	Lecture 14: Art & Engineering	Ethics HW, Art HW
29	FINALS	Check eCampus multisection for time and place	

(* dates may be changed due to exigent circumstances)

Course Topics, Calendar of Activities*, Major Assignment Dates

IMPORTANT: Because of holidays which occur during the term, schedules will vary among sections. Pay attention to the instructions given by your instructor.

ENGR/PHYS 216 section(s) 411, 412, 510, 511, 512

TUESDAY LECTURE, THURSDAY LAB

Meeting	Date	Topic	Work due
1	T 1/14	Lecture 1: Introduction, Propagation of Error	
2	R 1/16	No Lab 1 st week	
3	T 1/21	Lecture 2: Intro to Excel	HW 1
4	R 1/23	Lab 1: Introduction to the Air Table	Teams Assigned
5	T 1/28	Lecture 3: Finite differences	
6	R 1/30	Lab 2: Visual Odometry	Lab 1 report
7	T 2/4	Lecture 4: Basic Experimental Statistics	HW 2
8	R 2/6	Lab 2, take 2	
9	T 2/11	Lecture 5: Confidence Intervals	
10	R 2/13	Lab 3: Motion Control	Lab 2 report
11	T 2/18	Lecture 6: UAE	HW 3
12	R 2/20	Lab 3, take 2	
13	T 2/25	Lecture 7: Particle Statics	
14	R 2/27	Lab 4: Force Evaluation	Lab 3 report
15	T 3/3	Lecture 8: Conservation of Momentum (Collisions)	HW 4
16	R 3/5	Lab 4, take 2	
	SPRING BREAK		
17	T 3/17	Lecture 9: Rigid Body Statics	
18	R 3/19	Lab 5: Collisions	Lab 4 report
19	T 3/24	Lecture 10: Center of Mass and Angular Momentum	HW 5
20	R 3/26	Lab 5, take 2	
21	T 3/31	Lecture 11: Harmonic Motion	
22	R 4/2	Lab 6: Rotational Motion	Lab 5 report
	Sat 4/4	DI Saturday (required)	
23	T 4/7	Lecture 12: Engineering Ethics (1)	HW 6
24	R 4/9	Lab 6, take 2	
25	T 4/14	Lecture 13: Engineering Ethics (2)	
26	R 4/16	Lab 7: Harmonic Motion	Lab 6 report
27	T 4/21	Lecture 14: Art & Engineering	Ethics HW, Art HW
28	R 4/23	NO LAB	Lab 7 report
29	FINALS	Check eCampus multisection for time and place	

(* dates may be changed due to exigent circumstances)

Course Topics, Calendar of Activities*, Major Assignment Dates

IMPORTANT: Because of holidays which occur during the term, schedules will vary among sections. Pay attention to the instructions given by your instructor.

ENGR/PHYS 216 section(s) 207, 208

WEDNESDAY LECTURE, FRIDAY LAB

Meeting	Date	Topic	Work Due
1	W 1/15	Lecture 1: Introduction, Propagation of Error	
2	F 1/17	No Lab 1 st week	
3	W 1/22	Lecture 2: Intro to Excel	HW 1
4	F 1/24	Lab 1: Introduction to the Air Table	Teams Assigned
5	W 1/29	Lecture 3: Finite Differences	
6	F 1/31	Lab 2: Visual Odometry	Lab 1 report
7	W 2/5	Lecture 4: Basic Experimental Statistics	HW 2
8	F 2/7	Lab 2, take 2	
9	W 2/12	Lecture 5: Confidence Intervals	
10	F 2/14	Lab 3: Motion Control	Lab 2 report
11	W 2/19	Lecture 6: UAE	HW 3
12	F 2/21	Lab 3, take 2	
13	W 2/26	Lecture 7: Particle Statics	
14	F 2/28	Lab 4: Force Evaluation	Lab 3 report
15	W 3/4	Lecture 8: Conservation of Momentum analysis (Collisions)	HW 4
16	F 3/6	Lab 4, take 2	
	SPRING BREAK		
17	W 3/18	Lecture 9: Rigid Body Statics	
18	F 3/20	Lab 5: Collision Characterization	Lab 4 report
19	W 3/25	Lecture 10: Center of Mass and Angular Momentum	HW 5
20	F 3/27	Lab 5, take 2	
21	W 4/1	Lecture 11: Harmonic Motion	
22	F 4/3	Lab 6: Angular Momentum	Lab 5 report
	Sat 4/4	DI Saturday (required)	
23	W 4/8	Lecture 12: Engineering Ethics (1)	HW 6
	F 4/10	NO CLASS (reading day)	
24	W 4/15	Lecture 13: Engineering Ethics (2)	
25	F 4/17	Lab 6, take 2	
26	W 4/22	Lecture 14: Art & Engineering	Ethics HW, Art HW
27	F 4/24	Lab 7: Harmonic Motion	Lab 6 report
28	T 4/28	(Redefined Friday) NO LAB	Lab 7 report
29	FINALS	Check eCampus multisection for time and place	

(* dates may be changed due to exigent circumstances)

IMPORTANT DATES:

January 13 – First day of spring semester classes.

January 17– Last day (by 5 p.m.) for adding/dropping courses for the spring semester.

January 20 – MLK Day, no class

March 2 – Mid-semester grades due.

March 9 – March 13 – Spring Break

April 10 – Reading day, no classes

April 14 – Last day (by 5 p.m.) to drop courses with no penalty (Q-drop) or to officially withdraw from the University

April 21 – Muster

April 28 – A Tuesday, but students attend Friday classes

April 28 – Last day of classes

April 30-May 5 – Final exams

Americans with Disabilities Act (ADA)

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit <http://disability.tamu.edu>. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Attendance:

Attendance in class is mandatory. TAMU policies regarding student attendance/absences are defined in Part I, Section 7 of the TAMU Student Rules. In addition to those rules, the following policies will apply in this course:

1. An excused absence will be required for any day in which a graded assignment was due or exam was given.
2. There will be no opportunity to makeup in-class or out-of-class assignments, exams, RATs, CFU or any other “graded” materials due to an unexcused absence.

Student Rules:

TAMU Student Rules are posted at <http://student-rules.tamu.edu>. You should be familiar with these by now. Any issue not addressed explicitly in this syllabus will be governed by the Student Rules.

Academic Integrity:

“An Aggie does not lie, cheat, or steal or tolerate those who do.” Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: <http://aggiehonor.tamu.edu>.

Students: Please include “ENGR 216” or “PHYS 216” + “Section Number” in the subject line of all email correspondence.