PHYSICS 222 FALL 2019 SYLLABUS

COURSE ADMINISTRATOR: **Prof. Kerry Whisnant,** whisnant@iastate.edu, 294-3735
OFFICE HOURS: A507 Zaffarano, by appointment

LECTURER: **Prof. John Lajoie**, lajoie@iastate.edu, 294-6952
LECTURE HOURS: MWF 1:10 – 2:00 PM and MWF 3:10 – 4:00, Room 5 Physics
OFFICE HOURS: A329 Zaffarano, by appointment

LAB SUPERVISOR: **Dr. Paula Herrera**, siklody@iastate.edu, 294-8893
OFFICE HOURS: 15 Physics, by appointment

COURSE SECRETARY: Deb Schmidt, debs@iastate.edu , 12 Physics, 294-4936

PLEASE ADDRESS ALL EMAIL COMMUNICATIONS TO: whisnant@iastate.edu

ALL LECTURES ARE HELD IN PHYSICS ROOM 5

COURSE MATERIALS:

Textbook (required): *University Physics (14th Edition)*, Young and Freedman (Pearson, Addison Wesley, 2015).

Access Code (required): **14th Edition access code for Modified Mastering Physics online homework system. CAUTION: earlier edition codes won't work.** If you are retaking the course and have an old 13th edition access code, you will be given a new code to access the 14th edition material (see the Pearson rep during the first week).
IMPORTANT NOTE: To register for MasteringPhysics, go to the MyLab and Mastering link in *Canvas* and follow the instructions there. **The 14th edition allows you to register for and link to MasteringPhysics via Canvas – you should always log on to MasteringPhysics via Canvas.** Register for MasteringPhysics as soon as possible. If you experience any problem, please send an email to Prof. Kerry Whisnant (**whisnant@iastate.edu**).

ADDITIONAL MATERIALS:
We will be using Top Hat in the lectures. Credit for Top Hat scores will begin on Monday, September 9. A total of 10 extra credit points for the semester are allotted to lecture questions using Top Hat.

THIS COURSE HAS TWO EVENING EXAMS. Note the exam dates of

Thursday, October 10	**8:15 – 10:15 PM**
Thursday, November 21	**8:15 – 10:15 PM**

on the schedule below and MAKE NO OTHER PLANS FOR THESE EVENINGS.

Date	Class (lecture/recitation)	Assignments	Quizzes
M Aug 26	**1.** Density, pressure, Pascal's law	Read: 12.1, 12.2	
T Aug 27	Worksheet 1: Fluid statics	**Mastering Tutorial**	No quiz
W Aug 28	**2.** Buoyancy, surface tension, fluid flow	Read: 12.3, 12.4	
F Aug 30	**3.** Bernoulli's equation	Read: 12.5, 12.6	
M Sep 2	**LABOR DAY HOLIDAY – NO CLASS**		
T Sep 3	Worksheet 2: Fluid dynamics	**Hmwk 1 (due 6 AM)**	Q1: Lect. 1-3
W Sep 4	**4.** Electric charge, Coulomb's law	Read: 21.1-21.3	
F Sep 6	**5.** Electric field	Read: 21.4-21.5	
M Sep 9	**6.** Electric field and field lines	Read: 21.5-21.6	
T Sep 10	Worksheet 3: Coulomb's law and electric fields	**Hmwk 2 (due 6 AM)**	Q2: Lect. 4-5
W Sep 11	**7.** Electric field lines and dipoles	Read: 21.6-21.7	
F Sep 13	**8.** Electric flux, Gauss's law	Read: 22.1-22.3	
M Sep 16	**9.** Examples of Gauss's law	Read: 22.4-22.5	
T Sep 17	Worksheet 4: Electric flux and Gauss's law	**Hmwk 3 (due 6 AM)**	Q3: Lect. 6-8
W Sep 18	**10.** Electrical Potential	Read: 23.1-23.3	
F Sep 20	**11.** Equipotentials	Read: 23.4-23.5	
M Sep 23	**12.** Capacitors	Read: 24.1-24.2	
T Sep 24	Worksheet 5: Electric potential and capacitors	**Hmwk 4 (due 6 AM)**	Q4: Lect. 9-11
W Sep 25	**13.** Energy Storage & Dielectrics	Read: 24.3-24.5	
F Sep 27	**14.** Current; Resistance, Ohm's law	Read: 25.1-25.3	
M Sep 30	**15.** Circuits, Power, Resistors	Read: 25.4-25.5, 26.1	
T Oct 1	Worksheet 6: Resistance and circuits	**Hmwk 5 (due 6 AM)**	Q5: Lect. 12-14
W Oct 2	**16.** Kirchhoff's rules	Read: 26.2	
F Oct 4	**17.** Real batteries, electrical instruments	Read: 25.4, 26.3	
M Oct 7	**18.** Examples of DC circuits	Read: 26.1-26.3 and supplementary material in Canvas	
T Oct 8	Worksheet 7: Kirchoff's rules	**Hmwk 6 (due 6 AM)**	Q6: Lect. 15-17
W Oct 9	Exam review (optional)		
R Oct 10	**EXAM 1 (8:15 – 10:15 PM; LECTURES 1-17)**		
F Oct 11	**19.** RC Circuits	Read: 26.4	
M Oct 14	**20.** Magnetic field, field lines, moving charges	Read: 27.1-27.4	
T Oct 15	Worksheet 8: RC circuits	**Hmwk 7 (due 6 AM)**	Q7: Lect. 18-19
W Oct 16	**21.** Applications. Force on a current.	Read: 27.5-27.6	
F Oct 18	**22.** Force on a current loop, electric motor, Hall effect. Magnetic field by a moving charge.	Read: 27.7-27.9; 28.1, 28.2	

M Oct 21	**23.** Magnetic field by a current.	Read: 28.3-28.6	
T Oct 22	Worksheet 9: Magnetic fields	**Hmwk 8 (due 6 AM)**	Q8: Lect. 20-22
W Oct 23	**24.** Ampere's law and applications	Read: 28.6, 28.7	
F Oct 25	**25.** Magnetic materials	Read: 28.8	
M Oct 28	**26.** Induction, Faraday's law, Lenz's law	Read: 29.1-29.4	
T Oct 29	Worksheet 10: Induction and Lenz's law	**Hmwk 9 (due 6 AM)**	Q9: Lect. 23-25
W Oct 30	**27.** Induced fields, displacement current	Read: 29.4, 29.5, 29.7	
F Nov 1	**28.** Inductors, stored energy, LR circuit	Read: 30.1-30.4	
M Nov 4	**29.** LR, LC, and LRC circuits	Read: 30.4-30.6	
T Nov 5	Worksheet 11: Inductors	**Hmwk 10 (due 6 AM)**	Q10: Lect. 26-28
W Nov 6	**30.** AC circuits, phasors, LRC circuit again	Read: 31.1-31.3	
F Nov 8	**31.** AC power, resonance, transformers	Read: 31.4-31.6	
M Nov 11	**32.** Power distribution systems, AC power circuits	Read: 26.5 and supplementary material in Canvas	
T Nov 12	Worksheet 12: AC circuits	**Hmwk 11 (due 6 AM)**	Q11: Lect. 29-31
W Nov 13	**33.** Complex impedance. Examples of AC power circuits	Read: supplementary material in Canvas	
F Nov 15	**34.** Review of classical waves	Read: 15.2-15.4, 15.6, 15.7, 16.6	
M Nov 18	**35.** Electromagnetic waves, Maxwell's equations	Read: 32.1-32.3	
T Nov 19	Worksheet 13: Phasors and complex impedance	**Hmwk 12 (due 6 AM)**	Q12: Lect. 32-33
W Nov 20	Exam review (optional)		
R Nov 21	**EXAM 2 (8:15 – 10:15 PM; LECTURES 18-33)**		
F Nov 22	**36.** Energy, momentum and standing waves	Read: 32.4-32.5	
Nov 25-29	**THANKSGIVING BREAK – NO CLASS**		
M Dec 2	**37.** Reflection, refraction, total internal reflection	Read: 33.1-33.3	
T Dec 3	Worksheet 14: EM waves. Reflection and refraction	**Hmwk 13 (due 6 AM)**	Q13: Lect. 34-36
W Dec 4	**38.** Dispersion, polarization, Huygen's principle	Read: 33.4, 33.5, 33.7	
F Dec 6	**39.** Interference and phasors	Read: 35.1-35.3	
M Dec 9	**40.** Thin films and interferometers	Read: 35.4-35.5	
T Dec 10	Worksheet 15: Polarization. Interference	**Hmwk 14 (due 6 AM)**	Q14: Lect. 37-39
W Dec 11	**41.** Single and double slit diffraction	Read: 36.1-36.4	
F Dec 13	**42.** Diffraction grating, X-rays, resolving power	Read: 36.5-36.7	
DEC 16 -- 19	**FINAL EXAM (DATE OF EXAM TO BE ANNOUNCED)**		
The final exam will be comprehensive, with emphasis on lectures 34-42, and will include lab questions			

COURSE OBJECTIVES

The objective of this course is to provide a broad exposure to basic physical phenomena. Whereas the class schedule above provides a topic-by-topic list of specific subjects to be covered, the broader goals are:

- Understand basic fluid statics and dynamics
- Understand the concepts of electric charge, field, potential and magnetic fields
- Understand the components and characteristics of electric circuits
- Have a basic understanding of electromagnetic waves and wave optics
- Understand the use of phasors in AC circuits and interference phenomena

The quizzes and exams, in addition to test student knowledge, also serve as guide for the instructor to further focus and improve the presentation of the material, both for this semester, as well as future ones.

HOMEWORK

All assigned homework sets are online MasteringPhysics homework sets. Each student must purchase, at the ISU bookstore or online, an access code to the MasteringPhysics site and then log in through *Canvas*. The **online problem sets** are **due on Tuesday morning by 6 AM**, and graded automatically. The homework sets are designed so that you can work on problems through the week as the material is presented in lecture. Please do not make the mistake of waiting until Monday night to start the homework set!

If you encounter difficulties with a submission, please consult the MasteringPhysics instructions. If that does not solve the problem, send an e-mail to **whisnant@iastate.edu**. Under exceptional circumstances, **and only under exceptional circumstances** (e.g. computer or server breakdowns), extensions may be granted.

It is to your advantage to work with other students to learn the material. This can often help you to do better on the exams and homework. We encourage you to work together and perhaps form a study group. You may meet in the Physics 222 help room, if you wish. However, any work you turn in must be your own. Please see the academic honesty statement for guidelines about working on homework assignments in a group.

Please note that the three exams are worth 62.5% of your grade, and many of the problems on the exams will be similar to the assigned homework problems, quiz problems, and the Example Problems in lecture and in the textbook. In order to do well on the exams, you have to understand and be able to produce the solutions to these problems! In particular, copying homework solutions, rather than doing them yourself in order to get a few more points on the homework, is counterproductive and self-defeating, not to mention academically dishonest.

EXAMS

MID-SEMESTER EXAMS: This course has evening exams. Note the exam dates:

Thursday, October 10	**8:15 – 10:15 PM**
Thursday, November 21	**8:15 – 10:15 PM**

on the schedule above, **and make no other plans for these evenings.** Evening exams are used in this course so that all students can take the same exam at the same time and thus be graded on the same basis. Room assignments and instructions will be posted and discussed in advance of each exam. The exams this semester will be multiple-choice. Approximately 30 – 40% of the problems will emphasize understanding of the physics concepts, whereas the remainder will be numerical problems to test your ability to apply these concepts.

FINAL EXAM: December 16 – 20, time and day TBA, 120 minutes
The date and time of the final exam will be announced when they become available. The final exam covers all lectures and includes four questions about the Physics 222 labs.

Bring to each exam a Number 2 pencil, a scientific calculator and your student ID card. Programmable and/or charting calculators are not necessary but may be used. Laptops or PDA's are not allowed. **Devices with wireless technology are not allowed.** Each copy of the exam will include the values of any physical constants you may need, a formula sheet and scratch paper. You are not allowed to use your own formula sheet.

Conflicts: If you have a conflict with the scheduled time for the final exam or any other reason why you cannot take the exam at the assigned time, you must notify Prof. Whisnant **before 5 PM Friday, December 6** so that an alternative arrangement may be found.

Make-up exams will be allowed only in exceptional circumstances, such as illness, family emergencies (not anniversaries, family vacations, etc.), or **official** university-sponsored activities. Students who know in advance that they will miss an exam as a result of one of these university-sponsored activities must explain the circumstances to the course administrator, Prof. Whisnant, well before the exam and seek permission to take a make-up exam. After the fact, such permission will not be granted. Students who miss an exam because of illness or other unforeseen emergencies should send an email to **whisnant@iastate.edu** before the start time of the exam in order to receive permission to take the make-up exam. Make-up exams for Exam 1 and Exam 2 will be administered at a mutually agreed upon time before the end of the week following the regularly scheduled exam time. Make-up exams for the final will be handled on a case-by-case basis. More detailed instructions will be given to students who meet the above guidelines for taking the make-up exams.

Exam scores: If you believe there has been an error in the grading of an exam or in the final grade assigned to you, you need to contact Prof. Whisnant at **whisnant@iastate.edu no later than one week after the results are released.**

RECITATIONS

There will be one, 50-minute, recitation on Tuesday during any given week (see schedule).

The recitations in this course are conceived as a hands-on, interactive activity. Students will work in small groups on a worksheet or problem provided by the recitation instructor. Discuss, sketch, ask, explain, disagree, think aloud… but don't sit back and wait for the instructor to solve the problem on the board. Your instructor is there to help you through the problems, to answer your questions and to monitor your understanding of the material. Learning is done best by doing, not by watching.

Quizzes: At the end of every recitation (except during the first week of classes), a 10-minute quiz will be given. See the schedule for material covered by each quiz. Quizzes will be graded by the recitation TA and handed back to the students the following week. Note that each quiz will be based on material in the homework assignment due that day. This is where serious effort on the homework assignments will start paying off.

Missed quiz: If you miss a quiz for a good reason (e.g. being sick or being away due to an ISU related activity), you must bring some document to provide the reason of your absence to your TA who will give you an Excused Grade. At the end of the semester your score for the missed quiz will be the average of your scores on all the other quizzes.

LABS

All lab-related information and material is in a **separate** Canvas course called **PHYS 222 LABS (Fall 2019).** Access this page as soon as possible to:

a. Read the Laboratory Organization and Policies;
b. Take the Laboratory Policies Quiz (you need a **perfect** score on this quiz); and
c. Figure out when your lab section meets for the first time.

In particular, make sure you understand the make-up lab policies.

If you have problems accessing the lab Canvas page, please contact the lab supervisor, Paula Herrera (siklody@iastate.edu).

Completing the lab requirements is a mandatory part of PHYS 222. Failure to do so will result in an F for the entire course, independently of your performance in other components.

The final exam will contain four questions about the labs.

Lab waivers:

- If you have completed the laboratory part of the course successfully during a previous semester at ISU, you may request a lab waiver **during the first week of classes**. This is done through the LABS Canvas.

- If this waiver is granted, your old lab grade will be used.

GRADING

COURSE GRADES are based on a numerical score determined as follows:

Points	
Two, mid-semester night exams (75 points each)	150
Final exam	100
Quizzes	70
Homework	30
Laboratory grade	50
Maximum Total	**400**

Letter Grade Scale	
≥ 325	A- or better
≥ 285	B- or better
≥ 245	C- or better
≥ 215	D- or better
< 215	F

The above point scale for letter grades for the course will not be raised, but may be lowered. **A failing course grade (F) will be given if: (1) the student has not satisfactorily completed the laboratory requirements, or (2) the student has engaged in any form of academic dishonesty.**

Homework scores: Homework is an investment. The "direct" credit from homework is only 7.5% of the final score, but this is the most important learning tool in the course. Homework is your opportunity to make mistakes and learn from them. Then you will be able to answer the exam and quiz questions correctly, which together carry 80% of the total points. Please note that the point score on your HW does not directly translate to points toward your final grade. There is a maximum of 30 points for HW, which will be calculated from the percentage of correct HW problems × 30.

Recitation and lab scores: The precise number of recitation/lab points you receive from your instructors during the semester will not necessarily be the same as the number that counts towards your final grade. Some instructors grade "hard" during the semester and some grade "easy". Thus, in the interest of fairness to all the students, quiz scores for some sections may be adjusted upwards if we determine that that instructor is a hard grader. This means you will not automatically get a lower grade if you have a hard grader. An average student in an average recitation section typically receives about 70-75% of the maximum points possible.

Participation: There will be extra credit worth up to 10 points given for participation in lecture based on the responses to the lecture questions. We are using **Top Hat** for responses to lecture questions. Students can answer questions through Top Hat via most web browsers on a computer and through the device-specific Top Hat apps. Go to the Top Hat website https://tophat.com/ to access to this course: click on Sign-up and choose Student from the options. Enter the join code appropriate for your lecture: **669835** (1:10 PM) or **092519** (3:10 PM) to gain access to your Top Hat course. Students can also text in answers (315) 636-0905 (in case of poor WiFi or older phones). You need to set up your Top Hat account during the first two weeks of classes in order to receive the maximum possible extra credit.

Gradebook: The gradebook is available online in *Canvas*. Log in using your regular ISU NetID and password. Please notify us at **whisnant@iastate.edu** if you have access problems. You should regularly check that all your scores are correctly entered in the online gradebook. It is **your responsibility** to bring any problems to the attention of your section instructor immediately.

SUCCEED IN PHYSICS 222 !

Students often ask how they should study for the course and the exams. Some suggestions are:

- Be sure to read the indicated reading assignments before each lecture. The reading assignments are essential to understanding the material presented in the lecture.
- Actively review (= redo without looking at the solution) the assigned homework problems and solutions as well as recitation worksheets and quizzes. Be sure you understand all of the concepts as well as the steps associated with each problem.
- As needed, reread the chapter summaries in the textbook. Review the appropriate sections and/or go over your lecture notes.
- Solve extra questions and problems in the textbook. Do as many additional end-of-chapter problems as you need to thoroughly understand the material. The answers to the odd-numbered problems are in an appendix at the end of the text, and the complete solutions to about half of the odd-numbered problems are given in the optional *Student Solutions Manual*, available in the bookstore.
- Attend the review lectures prior to the exams and/or special review sessions scheduled by recitation instructors.
- Use exams from previous semesters for studying for the exams. They can be found on the course web page. The level of difficulty is about the same as of the exams this semester.
- Use the exams and quizzes from this semester to identify weak spots in your knowledge and skills. Use any missed question on a quiz or on one of the two mid-semester exams as an indicator for an area or concept that needs further study.

STUDENT ASSISTANCE

There are several opportunities for students to receive assistance with the material of this course:

- Room B54 Physics will be the Physics 222 Help Room. The staffing schedule will be posted on the door and in *Canvas*. The first day of Physics 222 Help Room is Tuesday, September 3. There will be no Help Room during finals week so that the TAs can prepare for and take their own exams.
- Instructor office hours (by appointment)
- Material on the course *Canvas* page.
- Supplemental Instruction (SI) sessions for Physics 222 (times to be announced by the SI instructors).

DROPPING THE CLASS

If you decide that you need to drop the class, please take the drop form to the course secretary, Deb Schmidt, in Room 12 Physics. Do not take the drop form to your instructor.

GENERAL ISSUES

Academic Dishonesty

The class will follow Iowa State University's policy on academic dishonesty: https://knowthecode.dso.iastate.edu/code-of-conduct

Anyone suspected of academic dishonesty will be reported to the Dean of Students Office.

Accessibility Statement

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Students requesting accommodations for a documented disability are required to work directly with staff in Student Accessibility Services (SAS) to establish eligibility and learn about related processes before accommodations will be identified. After eligibility is established, SAS staff will create and issue a Notification Letter for each course listing approved reasonable accommodations. This document will be made available to the student and instructor either electronically or in hard-copy every semester. Students and instructors are encouraged to review contents of the Notification Letters as early in the semester as possible to identify a specific, timely plan to deliver/receive the indicated accommodations. Reasonable accommodations are not retroactive in nature and are not intended to be an unfair advantage. Additional information or assistance is available online at www.sas.dso.iastate.edu, by contacting SAS staff by email at accessibility@iastate.edu, or by calling 515-294-7220. Student Accessibility Services is a unit in the Dean of Students Office located at 1076 Student Services Building.

Dead Week

This class follows the Iowa State University Dead Week policy as noted in http://catalog.iastate.edu.academiclife/gradingsystem/#examinationsdeadweektext

Harassment and Discrimination

Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or studentassistance@iastate.edu or contact the Office of Equal Opportunity and Compliance at 515-294-7612 or https://www.eoc.iastate.edu.

Religious Accommodation

If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.

Contact Information

If you are experiencing, or have experienced, a problem with any of the above issues, email academicissues@iastate.edu.