Physics 133/(02/03) – Physics II: Electricity, Magnetism and Waves
Course Description & Syllabus– Fall 2017

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Course Website: We will use Moodle – http://moodle.lafayette.edu. "PHYS 133.02(03) Fall 2017 Physics II: Electricity, Magnetism and Waves" should be in your list of current courses. Handouts, homework assignments/solutions, supplemental articles, etc., can be downloaded from this site. Taking a few moments to explore the site at the beginning of the semester is highly recommended. Announcements about class logistics (changes to HW dates, links to resources, etc) will also be made here.

Course Location and Times:

Class: Hugel Science Center 100
Monday, Wednesday, Friday; 9:00 - 9:50 AM (02)
Monday, Wednesday, Friday; 10:00 - 10:50 AM (03)

Laboratory: Tuesday (8:00 AM, 1:10 PM and 7:00 PM),
Wednesday (1:10 PM)
Thursday (8:00 AM and 1:10 PM)

Office Hours:

Monday: 1:30 - 3:30 PM
Thursday: 11:00 - 1:00 PM
Feel free to walk in with smaller questions whenever I am in my office.

Classes on Snow Days, Kaiju Attacks and Other Emergencies: If I am unable to make it to class I will send an email message via Moodle.

Description: This course is a calculus-based introduction to electricity, magnetism and waves, designed primarily for students majoring in science and engineering. We will study electrostatics, electrical currents, magnetostatics, induction, electromagnetic waves, interference and diffraction, topics all of which fall under the rubric of electromagnetism. There are sound reasons for spending an entire semester focused on this one subject:

- Electromagnetic forces are one of the four fundamental forces of nature (along with gravity, the weak and strong forces). Making matters even more interesting is the fact that electromagnetism and gravity are the only two forces producing readily visible effects.

- Electromagnetism introduced the first field theory and the study of fields underlies the analysis of all other physical forces. Further, the techniques used to study electromagnetism can be fruitfully applied to all other physical forces.

Goals: This course will enable you to understand, identify and apply the fundamental principles of classical electromagnetism to a wide variety of situations, from solving simple end-of-chapter problems to understanding how the world around you works. It will emphasize both qualitative reasoning and quantitative problem-solving. A secondary goal is to introduce the student to the process of doing physics, *i.e.*, developing and testing models, solving problems and communicating results in a clear and coherent way. Many of the skills developed in this course are readily transferable to any field of study requiring logical, critical thinking.

Student Learning Outcomes:

- Students will be able to apply the laws of electromagnetism to a wide variety of situations, including those encountered in everyday life.
- Will make connections between seemingly unrelated physical systems, for example, electrical and mechanical oscillators.
- Will appreciate the underlying unity and wide applicability of the wave concept (mechanical and electromagnetic waves).
- Will be able to identify and/or formulate a testable scientific hypothesis
- Will be able to generate and evaluate evidence necessary to test and/or revise a hypothesis
- Will understand how scientific uncertainty informs the evaluation of scientific hypotheses
- Will acquire or sharpen the mathematical skills necessary to describe electromagnetic phenomena.
- Will sharpen critical thinking skills and continue developing their analytical skills as they analyze ever more complicated physical systems.
- Will acquire an impressive array of problem-solving tools and cultivate a mindset of rational exploration
- Will appreciate the foundational nature of Physics and its relationship to other related disciplines as well as its connection with the solution of real-world problems.
- Will learn general problem solving skills including representing problems using simple physical models, reformulating problems into diagrammatic forms and identifying intuitive solution routes rather than brute force methods.

Co/Prerequisites: You must have credit for Physics 131. You must be enrolled in Math 162 or already have credit for that course.

Text book: The following text is required and is available at the college bookstore: Young and Freedman, ***University Physics with Modern Physics, 14th edition***. It is a great reference book and has almost everything you might want to know if you look hard enough. If you did not purchase Mastering Physics with text, you can buy it online at http://www.MasteringPhysics.com/.
Physics 133 - Laboratory Manual is available in the bookstore.

Grade breakdown

Homework:	25%
Tests 10% each x 3:	30%
Lab:	25%
Final exam	20%

Homework Problems: Homework problems will usually be on Mastering Physics unless it is a written homework. Your lowest homework grade will be dropped at the end of the semester. All assignments and other relevant course information will be available on Moodle. Note: The Mastering Physics course site name is – AHMEDPHY133**02** or AHMEDPHY133**03** depending on your section.

Tests: There will be three hour-long in-class tests on the dates marked on the syllabus. There will also be a cumulative final exam on a date to be determined by the registrar.

Final Exam: There will be a comprehensive final exam at a time to be determined by the registrar.

Attendance: Make sure to attend class regularly and participate in class discussions. I encourage you to ask clarifying questions as this is beneficial to not just you but your fellow classmates.

Ethos for grading written material: What I am looking for is your understanding of the material. If you show me your steps and thought processes clearly, and assuming those are correct, you will get the majority of the points. The actual final answer has minimal impact.

Academic Honesty: Discussing homework and collaborating with others is encouraged but make sure that the work you hand in is yours. Discussing concepts with others is always a great way to gain new perspectives but you must also truthfully demonstrate your own abilities. Cheating and other forms of academic dishonesty hurts no one but you in the long run.

Laboratory: You are responsible for completing all of the assigned experiments at the scheduled times. If you can't make it to your scheduled lab, please see me as soon as possible to arrange a make-up. You can't count on the equipment being available outside of the scheduled lab times.

Diversity, Inclusion and Equity Statement: Students should view this classroom as an inclusive space and safe haven for the free exchange of ideas. As your instructor one of my primary goals is to assure that the background, perspective and beliefs of each student are respected and appreciated regardless of race, ethnicity, gender, social class, sexual orientation, religion, political affiliation, ability level or learning style. Accordingly, I am committed to creating an atmosphere conducive to learning that respects diversity and inclusion and further promotes equity by removing educational barriers. As we work together to build this community of scholars, consider the following actionable points:

- Be open to the views of others.
- Feel free to share your own unique experiences.
- Honor and be enriched by the uniqueness of your classmates.
- View your classmates as respected resources of information and knowledge.
- Appreciate the opportunity to learn from classmates who may possess skill sets that complement your own.

Meeting Federal Credit Hour Standards: The student work in this course is in full compliance with the federal definition of a four credit hour course.

Moodle & Privacy: Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.

Physics 133/(02&03) Lecture Schedule Fall 2017

Date	Topics Discussed	Chapter: Section	Problem Set
Aug. 28	Introduction/Charges/Forces	Ch. 21:1-3	
Aug. 30	Electric Fields and Forces	Ch. 21:3-5	HW #1
Sept. 01	Field Lines and Torques	Ch. 21:6-7	
Sept. 04	Flux/Electric Flux	Ch. 22:1-2	
Sept. 06	Gauss's Law	Ch. 22:3	HW #2
Sept. 08	Applications of Gauss's Law	Ch. 22:4-5	
Sept. 11	Electrostatic Potential Energy	Ch. 23:1-2	
Sept. 13	Electric Potential	Ch. 23:3	HW #3
Sept. 15	Equipotential Surfaces	Ch. 23:4-5	
Sept. 18	Capacitance	Ch. 24:1-2	
Sept. 20	Electric Field Energy	Ch. 24:3-5	HW #4
Sept. 22	Electric Current	Ch. 25:1-2	
Sept. 25	Ohm's Law	Ch. 25:3-5	
Sept. 27	Energy and Power in Circuits	Ch. 25:5-6	
Sept. 29	**Hour Exam 1**	Chapters 21-25	
Oct. 02	Kirchoff's Rules	Ch. 26:1-2	
Oct. 04	RC Circuits	Ch. 26:4	HW #5
Oct. 06	Magnetic Fields	Ch. 27:1-3	
Oct. 09	**Fall Break**		
Oct. 11	Magnetic Forces on Charges	Ch. 27:4-5	HW #6
Oct. 13	Magnetic Forces on Currents	Ch. 27:6-8	
Oct. 16	Law of Biot-Savart	Ch. 28:1-4	
Oct. 18	Ampere's Law	Ch. 28:5-6	HW #7
Oct. 20	Applications	Ch. 28:7	
Oct. 23	Faraday's law	Ch. 29:1-4	
Oct. 25	Induction	Ch. 29:5-7	
Oct. 27	**Hour Exam II**	Chapters 26-29	
Oct. 30	Inductance and Magnetic Field	Ch. 30:1-3	
Nov. 01	Energy	Ch. 30:4-6	HW#8
Nov. 03	RL & LC Circuits	Ch. 15:1-5	
	Mechanical Waves		
Nov. 06	Superposition	Ch. 15:6-8	
Nov. 08	Sound Waves	Ch. 16:1-4	HW #9
Nov. 10	Resonance	Ch. 16:5-7	
Nov. 13	Electromagnetic Waves	Ch. 32:1-3	
Nov. 15	Energy/Momentum in EM Waves	Ch. 32:4-5	HW #10
Nov. 17	Reflection and Refraction	Ch. 33:1-3	
Nov. 20	Polarization and Scattering	Ch. 33:4-7	
Nov. 22	**Thanksgiving Break**		
Nov. 24	**Thanksgiving Break**		
Nov. 27	Interference	Ch. 35:1-2	
Nov. 29	Thin Film Interference	Ch. 35:4	
Dec. 01	**Hour Exam III**	Chapters 15-16, 30, 32, 33, 35	
Dec. 04	Diffraction	Ch. 36:1-4	
Dec. 06	Gratings and Circular Apertures	Ch. 36:5-7	HW #11
Dec. 08	Wrap-up and Final Review		
	Final Exam (Scheduled by Registrar)	Cumulative	