PS 250 – Physics III
Embry-Riddle University
Fall 2019

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Required text: *Sears & Zemansky's University Physics*, 14th ed, by Young & Freedman
Volume III, ERAU edition, Chapters 21-30,32,37,38

Recommended: *Physics*, by Tipler – QC 21.3 .T57
Lectures on Physics, by Feynman – QC 23 .F47
(www.feynmanlectures.caltech.edu)
Understanding Physics, by Asimov – QC 23 .A85
Cartoon Guide to Physics, by Gonick & Huffman – QC 24.5 .G66

"*Hyperphysics"* http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
"*Simple Nature*" http://lightandmatter.com/area1sn.html

Percentage system:		*Grading scale*:	
1 final exam	25%	A	90% –
3 tests	60% (20% each)	B	75% – 89%
quizzes	15%	C	60% – 74%
		D	50% – 59%

IMPORTANT NOTE

Listening to lectures is not enough (*you retain only 10% of what you hear …*). All processes of learning are somehow connected to active participation, and the learning of physics is no exception. Therefore, it is imperative that you work diligently at your own desk (*… 80% of what you practice …*). However, this does not mean that you should only work alone. I encourage you to form study groups and collaborate with your classmates (*… and 90% of what you teach to others!*).

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* This syllabus incorporates all existing University policies, especially those sections of the *Student Handbook* pertaining to academic integrity, civility, and respect. *

Course Description: This course is a calculus-based study of the fundamental principles of classical mechanics. It is the third course of a three-semester sequence, intended for students of science and engineering and is designed to provide the student with an appropriate background for more advanced physics and engineering course work. Topics of discussion include electric forces; electric field; Gauss's law; Ohm's law; Ampere's law; Faraday's law; Lenz's law; Kirchhoff's law and Maxwell's equations; electric potential and electrostatic potential energy; capacitance; simple DC circuit theory; magnetic force, magnetic field; inductance; electromagnetic oscillations and wave propagation; linear accelerators; and cyclotrons. **Prerequisites**: PS 160 and MA 242.

Prerequisite Knowledge:

1. Differentiation and integration of scalar and vector functions of one or several variables
2. Vector analysis; scalar dot products & vector cross products
3. Series expansions of functions
4. Newtonian mechanics of particles and rigid bodies, including rigid-body rotation
5. Wave motion; description of traveling waves; wave superposition and interference; speed and intensity of waves
6. Sound waves: traveling and standing waves; beats; Doppler effect for sound

Learning Outcomes:

1. Describe the interaction of static electric charges utilizing the concept of electric field and compute the electric field produced by simple charge distributions by direct integration and by employing Gauss's Law.
2. Define electric potential, potential energy, and capacitance, and solve related problems.
3. Analyze the behavior of simple direct-current circuits, including resistance-capacitance arrangements.
4. Describe the interaction of moving electric charges utilizing the concept of magnetic field and compute the magnetic field produced by simple current distributions employing the Biot-Savart Law and Amperes' Law.
5. Describe the creation of electric fields from changing magnetic fields (Faraday's Law) and the creation of magnetic fields from changing electric fields (Amperes' Law with displacement current) and solve problems involving electromagnetic induction and motional EMF.
6. Define inductance and analyze the behavior of resistance-inductance and inductance-capacitance circuits.
7. Describe the interplay of oscillating electric and magnetic fields required for propagating electromagnetic waves.

RULES

1. Arrive on time; depart on time.
2. Take notes, and bring calculator to each class.
3. No eating, no cell phones, no laptops.

Final Exam

Comprehensive; two hours; closed book; closed notes.
Tools: 2 sharp pencils, eraser, scientific calculator, 3x5 card (both sides) for equations.
Date: Mon 9 Dec, 10:15 am – 12:15 pm.

Tests

50 minutes; closed book; closed notes.
Tools: 2 sharp pencils, eraser, scientific calculator.
Dates: Mon 16 Sep (Ch 21-23), Mon 14 Oct (Ch 37, 27-29), Mon 18 Nov (Ch 24-26, 30).
Final exam will replace lowest test score.

Quizzes

12 take-home reading quizzes, based on each chapter.
9 in-class quizzes, based on worked examples in each chapter.

All assignments are due at the *beginning* of class on the due date, after which they will be considered late and the score will be reduced by 50%. After the beginning of the *next* class period, they will not be accepted.

General study habits

Repetition is critical for creating long-term memories. A good method for learning is the following sequence: read, listen, write, re-read, re-write, practice, and review. The textbook should be read THREE times: read once before class, read deeply (at least) once after class, and once as a review. In addition, you do not read textbooks as you would the newspaper. You must work through the examples, all mathematical steps should be confirmed, and you should write notes in the margins (it is your book, you can write in it!).

Notes

Taking notes during lecture is important – but you must review and re-copy those notes after class (within a few hours) for them to be useful. Notes that are never reviewed are less than worthless: they give you a false sense of security. It is important that you get into the habit studying every day.

Problem Solving

Solving problems is **critical** to your success in this course. An excellent method to prepare for the exams is to attempt problems at home in an exam-type environment. That is, once you have solved a group of problems, put aside the solutions and pretend that they are questions on an exam – attempt to solve them again, but without any help. Solve problems according to the following rules of coherence and readability:

- Describe *briefly* the basic principles used to solve the problem and *justify* the basic equation(s) that are used in the solution [DO NOT rewrite the question].
- If a physical situation is discussed in the problem, draw an appropriate diagram.
- Identify in words, or by clear references to the diagram, all the symbols you use.
- Work through the problem symbolically, getting a simplified symbolic answer, and only substitute numbers (if appropriate at all) at the very end.
- If you obtain an explicit numerical solution, comment on whether the value you get is reasonable.
- Put boxes around your final answers.
- Write up your solution neatly.

Study Groups

Do not simply copy another student's work, and do not simply copy from the solutions manual, but I recommend that you form study groups and work together. This can help you through difficult sections and problems. I encourage you to discuss, argue, arm-wrestle, and finally master the problems. However, I expect you to write up your solutions individually, showing your own insights.

"For most individuals, learning is most effectively carried out via social interactions."
- Ed Redish

day	PS 250 date		Young/Freedman 14e sections to read start	end	Fall 2019 topic	RQ	Q
1	Mon	26-Aug	21.1	21.3	Coulomb's law	21	
2	Wed	28-Aug	21.4	21.6	electric field		
3	Fri	30-Aug	21.6	21.7	field of dipole, line, disk		
4	Wed	4-Sep	22.1	22.3	Gauss's law	22	21
5	Fri	6-Sep	22.4	22.5	applications		
6	Mon	9-Sep	23.1	23.2	electric potential energy	23	22
7	Wed	11-Sep	23.2	23.3	electric potential I		
8	Fri	13-Sep	23.4	23.5	electric potential II		
9	Mon	16-Sep	test #1				
10	Wed	18-Sep	37.1	37.2	time dilation	37	
11	Fri	20-Sep	37.3	37.4	length contraction		
12	Mon	23-Sep	37.7	37.9	energy, momentum		
13	Wed	25-Sep	28.3	28.4	force between parallel wires		37
14	Fri	27-Sep	27.1	27.3	magnetic field, Lorentz force	27	
15	Mon	30-Sep	27.4	27.6	cyclotron motion		
16	Wed	2-Oct	27.7	27.9	forces and torques, Hall effect		
17	Fri	4-Oct	28.1	28.2	law of Biot-Savart	28	27
18	Mon	7-Oct	28.5	28.7	Ampere's law		
19	Wed	9-Oct	29.1	29.2	Faraday's law	29	28
20	Fri	11-Oct	29.3	29.5	Lenz's law, induction, emf		
21	Mon	14-Oct	test #2				
22	Wed	16-Oct	24.1	24.2	capacitance	24	
23	Mon	21-Oct	24.3	24.5	circuits, energy, dielectrics		
24	Wed	23-Oct			circuits with capacitors		
25	Fri	25-Oct	25.1	25.2	current, resistance	25	24
26	Mon	28-Oct	25.3	25.5	Ohm's law, emf		
27	Wed	30-Oct	26.1	26.2	Kirchhoff's laws	26	25
28	Fri	1-Nov			circuits with resistors		
29	Mon	4-Nov	26.3	26.4	RC circuits		
30	Wed	6-Nov	30.1	30.2	inductance	30	26
31	Fri	8-Nov	30.3	30.4	circuits with inductors, *RL*		
32	Wed	13-Nov	30.5		*LC* circuits		
33	Fri	15-Nov	30.6 , 14.7		*RLC* circuits, damped oscillations		
34	Mon	18-Nov	test #3				
35	Wed	20-Nov	29.7		displacement current		
36	Fri	22-Nov	32.1	32.2	electromagnetic waves	32	
37	Mon	25-Nov	32.3	32.4	energy, momentum		
38	Mon	2-Dec	38.1	38.4	wave-particle duality		32
39	Wed	4-Dec	review				
	Mon	9-Dec	final exam		10:15-12:15		

RQ = take-home reading quiz for each chapter - due at beginning of class

Q = in-class quiz on Examples from each chapter - at beginning of class

FALL 2019 PS 250

SUN	MON	TUE	WED	THU	FRI	SAT
25	26	27	28	29	30	31
SEP	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	OCT	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	NOV	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
DEC	2	3	4	5	6	7
8	9	10	11	12	13	14

PS 250-06 - MWF	11:00-11:50	COAS 207	FINAL:	Mon 9 Dec
PS 250-07 - MWF	12:00-12:50	COAS 207		10:15-12:15

test holidays