JOHN JAY COLLEGE OF CRIMINAL JUSTICE
The City University of New York
GENERAL PHYSICS II (PHY 204) SYLLABUS

***** Overview for both LECTURE and LAB Curricula *****

Summer Semester, 2013

Instructor: Daniel A. Martens Yaverbaum, dyaverbaum@jjay.cuny.edu

Martens Yaverbaum Office Hours:

Office 05.66.22NB, phone (212) 237-8980
Mondays, 2:30 pm – 4:00 pm,
Wednesdays, 2:30 pm – 4:00 pm

and *by appointment*. Even during office hours, advance communication and/or scheduling by email are always best.

Semester Credit Hours: 4 per Semester
Prerequisites: Physics 203, Math 242

This is the second semester of a two semester introductory course designed to provide the student with a rigorous command of the fundamental principles and problems comprising both classical and modern physics. The umbrella topics covered this semester are waves and fields—specifically those relating to sound, electricity, magnetism, radiation and optics. The central theme is the transfer of *information* and its relationship to principles of relativity. The ultimate purpose is to extend the predictive power of the relativity principles to the retrodictive program of modern forensic science.

Textbook:

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Upon completion of this course, a successful student should be able to:

1) ***KNOWLEDGE:*** Solve the simple differential equation governing simple harmonic motion; derive the fundamental wave equation and apply it to sophisticated examples regarding standing waves, overtones, optics and Doppler effects. Extend such knowledge to demonstrate a rigorous command of the distinction between the motion of particles and the propagation of information—particularly as such information relates to the study of forensic science.

2) ***REASONING:*** Relate and apply all four of Maxwell's integral equations in order to solve problems regarding electrostatic fields, magnetostatic fields and electromagnetic induction, thereby deploying a rigorous command of the relationship between electricity and magnetism.

3) ***PRACTICAL SKILLS:*** Design, build, measure, analyze and trouble-shoot circuits involving resistors and capacitors in both series and parallel configurations.

4) ***REASONING:*** Synthesize the relationship among Maxwell's equations with the wave equation, in order to derive the electromagnetic-radiative nature of light.

5) ***PRACTICAL SKILLS:*** Extend the nature of light to solve fundamental problems in reflection, refraction and diffraction, thereby demonstrating familiarity with the use of optical instruments in forensic science.

6) ***REASONING:*** Synthesize the wave behavior of light with Galileo's Principle of Relativity (as mastered in in the prerequisite Physics 203) to find Einstein's First and Second Postulates of Special Relativity, thereby demonstrating a familiarity with the character of physical law in the modern arena of high-speed particles.

Course Web-Page:

www.yaverbaum.org

Consult ***regularly***—every day—for syllabus, assignments, course information and updates. The Web-Page is used for the assignment calendar, supporting documents, exam preparation: in short, everything. Blackboard provides a link to the above site.

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Read the course web-page from left to right. The left-most column refers to the date of a particular class or lab—depending on which page you look at. The next column provides a brief title for the subject matter to be covered in class that day. The assignment column tells you WHAT IS DUE THAT DAY (***not*** what is assigned that day). The last column highlights relevant equations or expressions for that topic.

The assignments and labs are quite often links to original documents. You are always expected to ***print out and bring*** whatever is due and relevant for a particular class meeting.

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Course Policies

Labs and Lab Grading.

1) Every lab activity is done in a group of four (4) people. The groups will change two (2) to three (3) times in the semester. The lab-group change dates will be indicated on the lab web-page.

2) ONE LAB WRITE-UP PER GROUP will be submitted EVERY WEEK and graded on a 1-10 scale. IT CANNOT BE HAND-WRITTEN.

All lab reports must conform to a FOUR PART format that is contained and explained in detail in the first lab assignment. All details of this four part format, as explained in the first lab assignment, must be met in every lab report, unless explicitly otherwise stated. In brief, the four parts are:

i. Title Page,
ii. Methods & Findings Section

--always includes, among other requirements,

a fully labeled diagram (not photograph),
a thorough uncertainty analysis and
a clear and concise conclusion

iii. Special Instructions and Questions ("Triple-Starred") that apply to a given particular lab and/or were found in the particular lab hand-out,
iv. Appendices

3) Lab Activities known as "Board Meetings" are highly specialized discussion formats—involving the presentation of student work on white "Boards". For these discussions, no lab report is assigned. The lab report grade is instead assigned as follows:

0 = Absent from discussion.
8.5 = Present for discussion, but not actively participating.
10 = Present for discussion and contributed at least one substantive and respectful comment.

3) There will be no lab mid-term; there will be at least one “Lab Practicum”.

4) We supply student laptops for laboratory investigations.

5) If you know in advance that you have to miss a lab, you obtain permission of your lab instructor to join another lab period. If the instructor for that lab period gives you permission, you will complete your lab work in a different lab section that week.

6) You may miss and make up exactly one lab by the method described in (5), above.

7) For any missed labs beyond the one, you will not be able to receive a grade for the associated work.

8) Instructors have the discretion not to assign a passing grade—for the entire course—to any student who is missing for more than three lab periods.

9) ***The average of all your weekly 10-pt lab write-ups (approximately fourteen) will count for essentially 20% of your entire Physics 204 grade.*** (See below for precise details.)

General Grading:

1) Every assessment which is scored out of 100% (one final exam, two midterm exams, and one final lab grade) is given equal weight. One arithmetic mean is computed from all such assessments. This is your pre-assignment class average. When all is said and done, these assessments will together constitute essentially 80% of your final grade. (If, with sufficient notice, the instructor adds or eliminates a formal assessment, then every 20% piece changes accordingly—in order to maintain equal weight.) The rest of this formula explains how the remaining 20%--homework and extra credit—get factored in.

2) Every collected homework assignment is scored ***out of 4*** and the homework scores are added together. Every zero may result in the deduction of up to 3 points from this total. The sum is divided by a constant weighting factor (such as 5). This weighting factor may differ from semester to semester and is dependent on the overall class dynamic, participation and calendar.

3) The result from step (2) is treated as pure percentage points and added to your pre-assignment class average, step (1). This produces your pre-participation class average.

4) All points gained on written "Extra Credit" Assignments as well as 0 or 1 points of "Class Participation" points are added to your pre-participation class average. This class participation evaluation is based on signs of your vocal and auditory engagement in lecture, group-work ethic in lab and general assignment trend (e.g. a great many "4"'s have an impact that goes beyond the straight numerical sum). The sum of steps (1), (2) and (3) is your Final Class Average.

5) Please do note: The seeming complexity of the above system is in place so that your homework grade reward CONTINUAL EFFORT AND THOROUGHNESS above all else—even above accuracy of results. As a result of this system, the weighting percentages will not always be precisely 20%, 20%, 20%, etc. From semester to semester, they fluctuate slightly around such round numbers. The grading weights will, however, always be precisely ***uniform from student to student and from lab section to lab section***.

The BOTTOM GRADING LINE:

Each formal assessment is given equal weight in a straight average.
The sum total of all homeworks and extra credits amount to raw points added straight onto your class average.
For example, homework itself can easily amount to approximately 7 extra points on your class average.
You cannot "lose" points on homework unless you literally do not submit it.

That's it. Now let's spend the rest of our time thinking about physics.

May the net force be with us.

Physics 204 LECTURE: Summer, 2013

John Jay College of Criminal Justice: The City University of New York

Daniel A. Martens Yaverbaum

LAST UPDATED JUNE 3, 2013

Procedures & Policies

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DATE	LECTURE	READING	ASSIGNMENT	EQUATIONS
May 29	First Principles: 1. Particles & Information 2.Hooke's Law Review		Welcome (Back): UnThingy Things	F = -kx
May 29	Simple Harmonic Motion: Homogeneity of Time	HRW: Chapter 15	1. Complete Review Problem #1 (on ChalkBoard): A Thing On A Spring 2. page 405: Problem 9. PLUS: "Assume the mass of this oscillator is 30 kg. If an ideal spring is causing the simple harmonic oscillation, find the 'K' (force constant) for that spring." 3. page 406: Problem 29. 4. page 406: Problem 31.	
June 3	Differential Equation: A General Solution	Chapter 16	Oscillations & Waves	
June 3	A Uniformly Dense Sphere: A Particular Solution		p. 468: Problem 1, p. 469: Problem 21, p. 470: Problem 27, p. 471: Problem 39, p. 471: Problem 55.	

June 5	The Wave Equation: Derivation & Implication		Review for QUIZ Quest from P204 Summer, 2011	
June 5	Wave Speed			
June 10	**QUEST**		**QUEST** 1) Derive the Wave Equation from first principles: You will be given a blank sheet of paper and asked to reproduce the derivation found on pp. 423-424 of *HRW*. 2) You will be asked to solve exactly one multi-part problem regarding oscillations and waves. It will sharply resemble one h.w. problem that we solved in class; only the numbers and similarly small details will be changed to protect the innocent.	
June 10	The Doppler Effect	Chapter 17	KETCHUP! (No new problems: Catch Up on back assignments and/or sleep.)	
June 12	Interference		KETCHUP!	
June 12	Harmonics	Chapter 21	Electric Charge & Force	
June 17	Standing Waves in 1 and 2 Dimensions	Chapter 22	***	
June 17	Electric Charge & the Electrostatic Force	Chapter 23	p. 598: 3, 9, 19, 31 p. 622: 3	

June 19	Insulators, Conductors & Electrostatic Equilibirum			
June 19	Mid-Term Review	Chapter 24	Gauss's Law	
June 24	Electric Fields	Chapter 25		
June 24	Continuous Charge Distributions: Electric Flux	SOLVE MORE PROBLEMS!	PRACTICE MID-TERM	
June 26	Gauss's Law for Electric Fields	Chapter 26		
June 26	Uncertainty & Findings	Chapter 27	Measuring Along the Path From Pole to Pole	
July 1	Gaussian Symmetries & Distance-Dependences			
July 1	MID-TERM!	Chapter 28	SOLUTIONS to Practice Mid-Term	
July 3	Electric Potential & Capacitance	Chapter 29	Mid-Term EQUATION List	
July 3	Fundamentals of Circuits: Current and Resistance	Chapter 30		
July 8	Devices in Combination & The RC Circuit	Chapters 32, 33	Magnetic Field and Flux	
July 8	The RC Circuit	Chapter 35 (Intentionally out of Sequence)		
July 10	Magnetostatic Directions: Dot Products, Cross Products &	Chapter 35 (Intentionally out of Sequence)		
July 10	The Lorentz Force Law			
			EXTRA CREDIT I: Extra Credit: 1. Assuming the conservation of	

July 15	Magnetostatic Magnitudes: The Biot-Savart Law & Gauss's Law Revisited	Chapter 34 (Intentionally out of Sequence)	electric potential energy, type out a full derivation for the current as a function of time in an RC Circuit. 2. Assuming the numerical values presented BELOW for a particular RC Circuit (two resistors in parallel, one in series both with the pair and with the capacitor), find the amount of time for the current to decay to half its original value. Emf = 9 Volts. C = 100 micro-Farads. R1 (in main loop of circuit, series with battery and capacitor) = 400 Ohms. R2 = 200 Ohms, R3 = 300 Ohms. R2 and R3 are both in parallel with each other. But that parallel configuration itself is in series with everything else.	
July 15	Ampere's Law			
July 17	Electromagnetic Induction: Faraday's Law	Chapter 37	p. 884, Problem 7, p. 888, Problem 59, p. 919, Problem 47, p. 920, Problem 59, p. 954, Problem 68	
July 22	Displacement Current		SOLUTIONS TO MIDTERM	
July 24	Electromagnetic Radiation: Principle Begets Postulate		EXTRA CREDIT II DUE BRING PRACTICE EXAM TO CLASS!	
Thursday July 25	**FINAL EXAM**	in Lecture Room	PRACTICE EXAM SOLUTIONS (Solutions Updated/Corrected as of 7/23/12)	**Final EQUATION List**

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Physics 204: LECTURE	Physics 203: LECTURE	Physics 204: LAB
Skies of Yesternight	Physics 203: LAB	Elements

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Physics 204 LAB: Summer, 2013

John Jay College of Criminal Justice: The City University of New York

Daniel A. Martens Yaverbaum

LAST UPDATED MAY 29, 2013

Procedures & Policies

Lab Report Grading Rubric

email me

DATE	LAB	READING	ASSIGNMENT	PRINCIPLE
May 29	Lab #1. A Thing on a Spring: A Vertical Application of Hooke's Law	HRW: Chapter 15		
June 3	Lab #2A. A Thing on a String: The Planar Pendulum, *Measurement of Effects; Derivation of Cause*	Chapter 16	LAB #1 Write-Up Due: Fully follow the 4-part format explained at the end of the lab assignment. In so doing, make sure to: Provide neat, clear and complete responses to all triple-starred questions. Submit one value for *K*, two graphs and one final expression for period as a function of mass. Your Methods and Findings section must ultimately explain how you derived spring period as a function of spring mass and how the function makes use of your value for *K*.	

June 5	Lab #3A. A: Video Creation for the Wave Equation, *Oscillations in both Time and Space*			
June 10	Lab #3B. B: Video Creation for the Wave Equation *Analysis*		No Write-Up Due	
June 12	*Rotate Lab Groups:* Lab #4. Relative to the Medium: Video Simulation Lab for the Doppler Effect	Chapter 17	LAB #2 Write-Up Due: Respond to all Triple-Starred Prompts. Make certain to begin with a clearly labeled DIAGRAM of your set-up and conclude with a FINDINGS paragraph. Make certain that your FINDINGS paragraph makes use of uncertainty analysis to assess the validity of your findings, particularly that for the free-fall acceleration constant. PLEASE NOTE: There was an error in triple-starred question "k": It said "dependent" where the word should have been "independent". Please see revised lab on web-page for correct version of question.	
June 17	Lab #5. BOARD MEETING Alpha: Electric Charge & Force	Chapters 21, 22	LAB #3 Write-Up Due: Submit: 1) Two Complete and Clear Graphs of your Experimental Results (from 3A) 2) Responses to Any/All Triple-Starred Questions (from either/both) 4) One Complete and Clear Findings Section, following the directions at the end of the lab. Your findings must explain a response to the following question:	

			How does the function **y = A cos (wt + kx)** relate to waves and to the WAVE EQUATION?	
June 19	Lab #6A. Electrostatic Interaction (#26) Video File #1 Video File #2	Chapter 23	Full week provided for Lab #4 write-up. Lab #5 (Board Meeting Alpha) will not require a write-up.	
June 24	Lab #6B Electrostatic Interaction: Vernier Lab #25 Video File Associated File	Chapter 24	LAB #4 Write-Up Due: Respond to all Triple-Starred Prompts. Make certain to begin with a clearly labeled DIAGRAM of the simulated scenario and conclude with a clear and comprehensive FINDINGS section.	
June 26	Lab #6C BOARD MEETING Beta: Analyzing Electric Flux & Closed Integrals	Chapters 25, 26	No write-up required until we complete Lab #6A.	
July 1	*Rotate Lab Groups:* Lab #7A.	Chapter 27	LAB #6A Write-Up Due: Respond to all Triple-Starred Prompts. A) Make certain to begin with a clearly labeled DIAGRAM of your set-up and conclude with a clear and comprehensive FINDINGS section. B) Make certain to include TWO graphs: 1. R as a function of t and 2. q as a function of t. C) Your write-up MUST include a quantitative UNCERTAINTY ANALYSIS: 1) An average absolute uncertainty (+/-	

	Ohm's Law & Steady Circuits, Building Circuits		.5 units) for each measurement made, 2) An average fractional uncertainty for each measurement made (expressed as a percentage or decimal), 3) A combined fractional uncertainty for the final result (expressed as a percentage or decimal) 4) A combined absolute uncertainty for the final result (expressed in the same units as the final result), 5) A brief explanation of what this uncertainty quantity tells us about our finding.	
July 3	Lab #7B. Ohm's Law & Steady Circuits, Making Measurements	Chapters 28, 29	NO Write-Up Due: until both parts of Lab #7 are completed.	
July 8	Lab #8. The RC Circuit	Chapters 32, 33	Write Up for both parts of Lab #7 Due this week.	
July 10	*Rotate Lab Groups:* Lab #9. Board Meeting Gamma, B-Fields	Chapter 35 (Intentionally out of Sequence)	LAB #8 Write-Up Due: Respond to all Triple-Starred Prompts. Make certain to begin with a clearly labeled CIRCUIT DIAGRAM for each of your configurations. Make certain that your FINDINGS section makes use of uncertainty analysis to assess the validity of your findings, particularly any comparisons between predicted and measured values for current. Showing all work, thoroughly solve the circuit problem included in the final assignment section. Include diagrams that show each "equivalent resistance" simplification that you make in order to solve the problem.	
	Lab #10.	Chapter 34	No Write Up Required	

July 15	*Electromagnetic Radiation*: Light Intensity	(Intentionally out of sequence)	For Board Meetings	
July 17	Lab #11. *Electromagnetic Radiation*: Light Diffraction		LAB # 10 Write-Up Due: FULL and Customary 4-Part Format (Diagrams, Methods & Findings, etc.) Note: Any triple-starred questions to be answered separately.	
July 22	Lab #12. *Electromagnetic Radiation*: Light Refraction		LAB # 11 Write-Up Due: FULL and Customary 4-Part Format (Diagrams, Methods & Findings, etc.) Note: AnytTriple-starred questions to be answered separately.	
July 24	**EXAM: Practice & Review** (For Practice Exam itself, Please see link in row below)	Chapter 37	LAB # 12 Write-Up Due: FULL and Customary 4-Part Format (Diagrams, Methods & Findings, etc.) Note: Any triple-starred questions to be answered separately.	
Thursday, July 25	**FINAL EXAM**	in Lecture Room	PRACTICE EXAM SOLUTIONS (Solutions Updated/Corrected as of 7/23/12)	**Final EQUATION List**

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