PHYSICS 132 WINTER 2005 MWF 12:00-12:50

GENERAL PHYSICS II

Description: Continuation of PHY130 covering fluid mechanics, electricity and magnetism and optics. Emphasis will be placed on applications in the biological and medical sciences.

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Office Hours: MWF: 1:00-1:50 & MR 2:00 – 5:00 p.m.
Feel free to come by and see me at any other time too! If I'm in, I'll be happy to address any questions or concerns you may have.

Textbook: Physics by J.D. Cutnell & K.W. Johnson, 6th edition (John Wiley & Sons). Copies of the text are still available in the bookstore. From time to time, I shall provide articles or other handouts to supplement the material in the textbook.

Website: URL: http://knowledge.udmercy.edu/. On the website, you can access the lecture notes, solutions to assignments, general course information, as well as online quizzes!

Lectures: MWF 12:00 - 12:50 p.m. and F 2:00 - 2:50 p.m. A tentative syllabus for the semester is provided to you. The syllabus may be revised from time to time during the semester.

Prerequisites: The only formal prerequisite for this course is that you should have taken and passed Physics 130. However, you are expected to be familiar and comfortable with algebra, trigonometric functions, solutions of simple simultaneous equations etc.

Objectives: In this course, we will continue to analyze the motion of objects - their causes and effects. We will focus mainly on fluid dynamics and electrodynamics - the motion of objects due to the electromagnetic force. Properties of various materials arising from this force will also be presented. The fields of electric circuits and optics arise from the electromagnetic nature of light. We will discuss this in some detail.

Outcomes: Through this course, you should able to
a) Apply Pascal's and Archimedes problems to problems in fluid statics
b) Calculate fluid pressure, densities and velocities using Bernoulli's principle and the equation of continuity for fluid motion.
c) Calculate electrostatic forces and fields using Coulomb's Law for point charges.
d) Understand the difference between conductors and insulators.
e) Calculate the various properties of capacitors based on their capacitance.
f) Calculate the equivalent resistances and capacitances for series and parallel resistors and capacitors in electric circuits.
g) Apply Kirchoff's Laws to solve problems on the behavior of simple resistive circuits.
h) Analyze the dynamic behavior of different RC circuits.
i) Solve problems involving magnetic forces on moving charges and currents.
j) Calculate the magnetic fields produced by currents in simple configurations.
k) Apply Faraday's and Lenz's law to solve problems involving inductors, transformers, generators and motors.
l) Understand the processes of reflection, refraction, and polarization of light.
m) Apply the mirror equation and thin-lens equation to solve problems in optics.
n) Appreciate the concepts of diffraction and interference of light.

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Homework: Problems sets will be assigned every week. Some of the problems may appear verbatim on the exams. Therefore, it is in your best interest to understand and solve the homework problems. Homework is due at class time. Be sure to hand in your assignments on time because **LATE ASSIGNMENTS WILL NOT BE ACCEPTED!** Homework constitutes 25% of your final grade. See the attached sheet for all the relevant rules on homework assignments

Readings: It is essential that you come prepared for class by doing the necessary reading and ***completing a short reading assignmen***t. Assignments must be completed online on the course website. You will be asked to answer three short questions based on the reading. ***Assignments must be submitted by 9:00 a.m. the day of class.*** Your overall grade for these quizzes will reflect your participation, conscientious effort and level of preparation for class. The assignments constitute 10% of your final grade.

Participation: Attendance and participation in in-class discussions and online exercises is very important. Without this, you cannot hope to gain much from this course. I may take attendance in class from time to time! Every two unexplained absences will cost you 1% of your grade up to a maximum of 5%. Class participation will be worth 5% of your final grade. Good participation involves:
a) Coming to class on time and staying till the end of class.
b) Acting in a responsible, respectful and courteous manner while in class.
c) Actively participating in in-class discussions and activities.

Exams: The course will include two in-class one-hour exams and a final one-hour exam as scheduled by the university. The total exam grade will be 60%. It will be distributed as follows: Highest exam score: 25%; Next best score: 20%; Lowest score: 15%. As a rule, exams given later in the semester will expect you to remember important concepts presented earlier in the semester!

Exam Dates: Exam #1 - Monday, 2/14
Exam #2 - Monday, 3/21
Exam #3 - Thursday, 4/28

Grading:

90-100 : A	78-81 : B	63-67 : C-
86-89 : A-	73-77 : B-	58-62 : D
82-85 : B+	68-72 : C	<58 : F

Remember:

January 18	: Last day to add a class
February 4	: Last day to drop a course without a "W"
March 1	: Mid-term grades due
April 1	: Last day to withdraw from class

Honesty: The fundamental assumption under which the University operates is that work submitted by a student is the product of her or his own legitimate efforts. In other words, make sure the assignments (homework, exams etc) you submit reflect your own work! Any student suspected of cheating or plagiarism will be dealt with according to the policy set out in the Engineering and Science Student Handbook.

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Tentative Course Syllabus

DATE	TOPICS	SECTIONS
Week 1: 1/10		
Monday	Density & Pressure	11.1-11.2
Wednesday	Measuring Pressure	11.3-11.4
Friday	Pascal's Principle	11.5
Week 2: 1/17		
Monday	**Martin Luther King Jr. Day – Holiday**	
Wednesday	Archimedes Principle	11.6
Friday	Fluids in Motion: Equation of Continuity	11.7-11.8
Week 3: 1/24		
Monday	Bernoulli's Equation and Applications	11.9-11.10
Wednesday	Properties of Charge	18.1-18.3
Friday	Charging by Contact and Induction	18.4
Week 4: 1/31		
Monday	Coulomb's Law	18.5
Wednesday	Applying Coulomb's Law	
Friday	Fields and Field Lines	18.6-18.8
Week 5: 2/7		
Monday	Electric Potential Energy	19.1
Wednesday	Electric Potential Differences and Voltage	19.2-19.4
Friday	Capacitors and Dielectrics	19.5-19.6
Week 6: 2/14		
Monday	**EXAM #1**	
Wednesday	Batteries and Emf	20.1
Friday	Resistors and Ohm's Law	20.2-20.3, 20.9
Week 7: 2/21		
Monday	Resistors in Series	20.6
Wednesday	Resistors in Parallel	20.7-20.8
Friday	RC Circuits and Applications	20.13
Week 8: 2/28		
Monday	Properties of Magnets	21.1
Wednesday	Force on a Moving Charge	21.2
Friday	Motions of Charged Particles in Magnetic Fields	21.3-21.4

Course Syllabus (continued)

DATE	TOPICS	SECTIONS
Week 9: 3/7		
Monday	**Spring Break**	
Wednesday	**Spring Break**	
Friday	**Spring Break**	
Week 10: 3/14		
Monday	Force on a Current Carrying Wire	21.5
Wednesday	Torque on a Current Carrying Wire	21.6
Friday	Producing Magnetic Fields	21.7
Week 11: 3/21		
Monday	**EXAM #2**	
Wednesday	Inducing an EMF	22.1-22.2
Friday	**Easter Holiday**	
Week 12: 3/28		
Monday	Magnetic Flux	22.3
Wednesday	Faraday's Law	22.4
Friday	Lenz's Law	22.5-22.6
Week 13: 4/4		
Monday	The Electric Generator and Transformer	22.7-22.9
Wednesday	Properties of Electromagnetic Waves	24.1-24.6
Friday	Reflection of Light	25.1-25.2
Week 14: 4/11		
Monday	Formation of Images by Mirrors	25.3-25.5
Wednesday	The Index of Refraction and Snell's Law	26.1-26.2
Friday	Total Internal Reflection	26.3
Week 15: 4/18		
Monday	Polarization & Dispersion of Light	26.4-26.5
Wednesday	Image Formation by Lenses	26.6-26.8
Friday	Optical Instruments	26.10-26.13
Week 16: 4/25		
Thursday 4/28	**EXAM #3: 11:00 a.m.-12:50 p.m.**	

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Homework Assignments

Introduction: Problems sets will be assigned every week. Some of the problems may appear verbatim on the exams. Therefore, it is in your best interest to understand and solve the homework problems. Homework is due at class time. Be sure to hand in your assignments on time because **LATE ASSIGNMENTS WILL NOT BE ACCEPTED!** Homework constitutes 20% of your final grade.

Requirements: The following rules apply for homework assignments

- Students can work on homework assignments individually or in teams of two. Each student in a team will receive the same grade for the assignment.
- Homework should be submitted using the specific type of paper required. This paper is called *engineering paper* and is available in the campus bookstore. Assignments submitted on any other paper will not be accepted.
- You will be using only one side (the non-ruled side) of the paper. DO NOT write on both sides of the paper because that will make it impossible for me to read.
- Each homework problem should be solved in the specific format provided. Failure to do so will result in a failing grade for that assignment.
- Each homework problem should begin on a new page.
- It is your responsibility to hand in a neat, complete, and stapled assignment on time! No excuses will be allowed.
- The lowest score will be dropped in calculating your grade.

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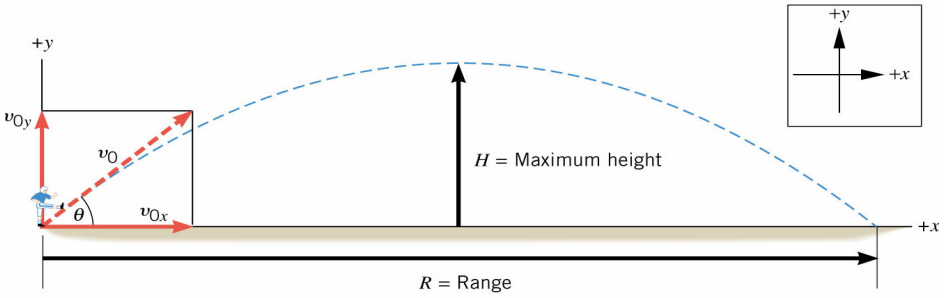
Sample Homework Solution

Ques: Suppose a golf ball is hit off the tee with an initial velocity of 30.0 m/s at an angle of 35^0 to the horizontal. a) What is the maximum height reached by the ball? b) What is its range? Note: You need **NOT** type in the question when you are doing your assignment)

Ans:

Diagram:



Given:
Initial velocity, $v_0 = 30.0$ m/s
Angle with horizontal, $\theta = 35^0$
Acceleration in the y-direction (vertical), $a_y = -g = -9.8$ m/s^2

Find:
a) Maximum height reached, $y_{max} = ?$
b) Range of the golf ball, $R = x_{max} = ?$

Reasoning:
a) When the ball passes through the maximum height, the vertical component of its velocity is changing from positive ("going up") to negative ("going down"). Therefore, the vertical velocity of the ball at the maximum height is zero, $v_y = 0$. Combining this data with the ball's initial vertical velocity, v_{y0}, and acceleration in the vertical direction, we solve for the maximum height.

Solution:
$v_{y0} = v_0 \sin\theta = 30.0$ m/s $(\sin 35^0) = 17.2$ m/s
$v_y^2 = v_{y0}^2 + 2\, a_y\, y_{max}$ => $0 = (17.2\text{m/s})^2 - 2(9.8\text{ m/s}^2)\, y_{max}$ => $\mathbf{y_{max} = 15.1\ m}$

Then, do the same for part b)…