

Physics&221: Engineering Physics (5 credits that feel like 7 or 8)

Spring 2011 WCC

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I prefer face-to-face (f2f) and email. Please set your communication linkages to my email address above, and I will get back to you at least within 24 hours during the week, and maybe 48 hours over the weekend. I am available to make individual and group appointments to facilitate problem solving, lab analysis, or advising and discussing strategies for success in this course.

Class meeting time: MWF 10:30am-11:50am Th 10am-1pm, Lab All sessions meet in physics lab Kulshan 210

Physics tutoring: Michael Greiner will provide tutoring for physics students; tutoring hours will be posted during the first week of the quarter and will meet in Kulshan 210 or 211. You are encouraged to utilize these services early in the quarter.

PreRequisites: MATH&151 (differential calculus) with a "C-" or better; ENGL 100/ESLA 117 or placement in ENGL& 101; and one college level **physics course** or a high school physics course. (Q, SR,MSI) A C- in calculus is truly the minimum for admission into the course. This grade would suggest you may need to improve your mathematics and physical science background before you embark on this course.

Course description: This course covers the major topics of mechanics including momentum and energy conservation, kinematics, Newton's laws and equilibrium. The major emphasis is to develop critical analysis, **problem solving** and scientific reasoning skills by considering numerous different systems and interactions, solving problems and discussion. We will use a systematic approach based on modeling systems by application of basic physics principles, making assumptions, utilizing multiple representations (not just mathematical) in order to become proficient at problem solving. Lab work is required and is designed to help you develop a questioning approach to physical situations, distinguishing the significant behaviors from the less significant behaviors of a system under study. You will be required to cooperate and collaborate with everyone in the class in order to succeed in this course, which is similar to successful work in science and engineering. In general there will be no formal lectures for this course. I will provide you with many resources for engaging presentation of basic course material. One source you might commit to watching are at [OCW on-line lectures by Prof. Walter Lewin](#).

Course Expectations: This course introduces fundamental consequences of physical interactions. The vocabulary should be extremely familiar from your prior physics studies. The concepts of forces, kinematics, momentum, energy, torque, and equilibrium will be examined. By the end of the course each student is expected to be able to interpret and use technical language, write and translate symbolic statements representing physical events, interpret and apply physical laws and make reasoned guesses and approximations in response to complex, multi-part questions. Students will also be expected to develop laboratory skills including observation, analysis and interpretation skills as well as logical, concise communication skills. Active participation in classroom activities will be required. Effort to engage in dialogue for clarification and explanations when asked will also be required. Individual improvement will be expected, building on strengths. Individual excellence will be emphasized.

The major emphasis of this course will be two-fold. First it will be to develop conceptual fluency so you can talk about the physics to real people, perhaps even explain things using your understanding of basic physics. The second is to develop analytical and problem solving strategies and skills sufficient that you can tackle complex situations, explain your analytical reasoning and judge whether your answer is sensible. This will be the most difficult part of this course, which requires a conceptual understanding in order to apply this to problem solving. The emphasis in Laboratory sessions will be on developing your abilities in all of these areas, the problems from lab may spill into class and vice versa. One of the luxuries of an education in a small institution with a high level of contact with the primary instructor is the coherence between activities that can be built. We will depend on this throughout the course.

Shift in thinking: Physics is not mathematics; nature is not understood by just coming up with a bunch of correct answers to various problems because you were successfully able to hunt down an equation or two. Expect some significant challenges to the comfort zones in your mind. I hope you enjoy them. Like the bodies way to build muscle requires serious discipline and work-outs, one of the lifetime rewards is that those muscle cells do not just disappear once you quit using them. Your expanded knowledge and scientific thinking resulting from your work this quarter will definitely not disappear as soon as the quarter is over and you quit pounding your head against physics problems every day.

Textbooks and required materials: The single most important requirement for success with this coursework is attitudinal. By engaging your intellectual curiosity, spending dedicated, clear-headed self-confident time every day working on physics problems you will get better at solving them and explaining your thinking. You must adopt the frame of mind that YOU are the one who has to work, must put in the time and must practice the disciplined approach to problem solving. The evidence is very clear; students do not learn much physics by being lectured to, waiting until the last minute to work on problems, failing to pursue resources to support their learning, and generally waiting for physics to be taught to them. Students must apply the principles themselves, because they are trying to pursue a deeper understanding. The course activities are intended to challenge your thinking, not just reinforce your comfort and confidence level. **Success then relies on your self-discipline**, the improvement of your mathematics, listening and questioning skills. If you do that, engage fully with the activities and problems offered to you self assess when you are struggling with an idea or situation and pursue helpful resources, you will be prepared for the quizzes and the exams. You will think better and understand more about how to comprehend the natural world.

***REQUIRED:**

1. Frequent access to ANGEL at <http://angel.whatcom.ctc.edu>

- **Assignments, study resources, and laboratory material** will be posted within the LESSONS folder in our ANGEL classroom. Some **assignments results will be posted here**, in the form of “assessments” that you can open and answer the questions online, and submit for me to follow up. Your **grades** and **Announcements** will be posted in our ANGEL classroom. You will automatically be enrolled in our Class “**S11 University Physics 221 WCC AL1 Section 1**”. The Login instructions will always come up on the first page. **username = your student number, password = first 5 letters of your last name**. Since this is a hybrid course, and you will not have a paper textbook, you will be expected to utilize multiple resources to develop your conceptual understanding, your rigorous problem solving skills and your fluency with the vocabulary of physics ideas. This vocabulary is much more than English terms and definitions, although that is always a good place to start. The vocabulary of physics is rich in mathematics, graphs, drawings, diagrams and terms defined with very narrow scope. The goal of utilizing this vocabulary is to communicate understanding and questions that are as clear and concise about our understanding of nature as is possible. Starting today, in this physics class, you will begin to be challenged to consider language and expression very rigorously. I will try to hold myself and you all to a high standard of clarity. Out of this clarity comes appreciation of natural patterns and symmetries, as well as the ability to inquire and consider deeply. It is the lack of ambiguity that we are seeking.

2. DAILY access to LONCAPA at <http://loncapa.mit.edu> : OUR “Text”-based material.

- This is where the skeleton of our course is defined. After the start up period we will start reading, using and working on problem at this interactive Calc-based Physics Text that is being written and is an evolving entity with a group of physicists at MIT. Students in classes round the country are utilizing this “Interactive Text”, while participating in research into the effectiveness of the curriculum and internet assets as learning tools. Because of this, we invite your input, feedback, editorial ideas, recommendations, reflections on difficulties you are having and any suggestions you may have to offer. The Discussion board in our LONCAPA space will be read by members of the research team; so not only are you required to participate in substantive discussions of physics with your classmates, you are also welcome to add reflective comments/suggestions etc. to the authors in this discussion board. Or you can send them to me directly, in an email or a conversation or on paper and I will bring them forward to our whole group. We will be working on student and data driven revisions this summer.
- This is where you will find our online Interactive WIKI-Text (ILEM WIKI), with interactive homework problems embedded. The first week of the quarter will be spent getting you up to speed on basic content expected for this course. Since the prerequisites are calculus and physics, please do not expect this course to feel like one of those first introductions to or a survey of physics. That said, there are always some missing pieces and a variety of strengths and weaknesses in every persons background starting this sequence. We will begin our work together ignoring the **ILEM-WIKI text**, and return to it after you have your first quiz.
- You will be enrolled in <http://LONCAPA.mit.edu> where your **username = your student number, and password = first 5 letters of your last name**.
- “**LONCAPA**” **homework**, found embedded in the ILEM-WIKI text will be required in this way: for each unit there are LONCAPA homework sections of three levels of problems/questions. We have called them “easy”, “medium” and “hard”, although that may not be accurate for your experience. Don’t worry about the idea that if we labeled them

“easy” that they ought to be easy for you, really they should be labeled 1 point/problem, 2 points/problem or 3 points/problem. You are required to earn at least 15 points (minimum) for each content module (“chapter?”) LONCAPA homework set: you can choose 5 of the 3 pt/prob or any combination of problems until you get at least 15 points. These problems will give you immediate feedback and they are not trivial: do not play with them like a computer game. You must think carefully about the concepts and representations using rigorous interpretations of the physics vocabulary. Your answers will be recorded and available for me and you to review. Of course, you are encouraged to **work all of the LONCAPA problems**. Quizzes will have problems similar to the 3 pts each LONCAPA problems.

- Reminder: we won't delve into this ILEM-WIKI-LONCAPA resource until the second week.

REQUIRED: **Student Workbook: To accompany Physics for Scientists and Engineers**, by Randall Knight, 2ed.

You can purchase this inexpensively online (<http://www.abebooks.com>) or (immediately, but expensive) at the bookstore. The ISBN for the single volume for this quarter only is:

- **Student Workbook for Physics for Scientists and Engineers: A Strategic Approach Vol 1 (Chs 1-15), 2/E**
Knight ISBN-10: 0321516265 | ISBN-13: 9780321516268

Or for

- **Student Workbook for Physics for Scientists and Engineers: A Strategic Approach, Standard Edition, 2/E** Knight©2008
ISBN-10: 0321516427 | ISBN-13: 9780321516428 (this is 29 chapters or something)
- The problems in this workbook are designed to help you develop fluency with the rest of the **physics vocabulary** that is not coded in mathematics. This means drawing, **graphing, proportional reasoning, interpretation of drawings, graphs and scenario deconstruction and construction**. Solutions will be posted in ANGEL> Lessons after the workbook problem assignments are due. The first Chapter to work on in Chapter 3: Vectors and Coordinate Systems. These should be completed by Monday April 11.

REQUIRED: email address that you check, calculator and frequent access to internet.

Recommended: Straight edge, colored pencils, engineering paper, high speed internet connection.

Internet search skills and frequent pursuit of movies, texts, simulations, resources available on the internet to help you, visualize and develop an understanding of the physics concepts and applications we address throughout the course. If you do not have strong internet search skills, the reference librarians will be good sources to help you. For a safe beginning you should go to <http://library.whatcom.ctc.edu> and find out what all the drop down menus have, what quick trainings are available for you and what the WCC Library already has linked for your assistance.

Your first week activities in this course are designed specifically to introduce you to some excellent physics resources as well as immerse you in using the internet as your “book”, helping you transition to this new course format.

One of the most densely packed databases for science is the **National Science Digital Library** <http://nsdl.org>. You should go there often, if you find something good, link the URL into a discussion board for the class... (more about how and where ... in class discussion) Another excellent source of physics simulations that are based on real physics, not just gaming goals can be found at <http://phet.colorado.edu/>. **You will be asked/assigned activities using several resources, as well as asked to find resources that will help you develop your understanding of physics.**

A Calculus based Physics wiki: http://en.wikibooks.org/wiki/Physics_with_Calculus This has an introduction to all topics, plus measurement, scientific notation, coordinates systems, Newton's laws. It is not our text.

A sophisticated, deep **Concept Map** of physics, with nested links to help you understand specific topics: <http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html#mechcon>

Recommended: Any Calculus based Physics text. Randall Knight, *Physics for Scientists and Engineers*, Ohanian, *Physics for Scientists and Engineers*, Halliday, Resnick, Walker, *Foundations of Physics*. Serway *Physics for Scientists and Engineers*, Douglas Giancoli, *Physics for Scientists and Engineers*,

Name of resource	date you are there
URL or pages that you are working in	
Questions	sketches zone
	<p>A diagram of a sphere of mass m on a horizontal surface. The forces shown are:</p> <ul style="list-style-type: none"> F_n: Normal force, pointing vertically upwards. F_2: Weight, pointing vertically downwards. F_1: A diagonal force, pointing up and to the right.
Hardest/why?	
still Unclear to me....	

COURSE ACTIVITIES And COURSE GRADE	%Percent of overall Grade	Brief description
Quizzes (4-5) Q1: Review Vectors, Newton's Laws, basic kinematics end of startup activities. Ap 15 Q2: TBA Q3: TBA Q4: TBA	10%	There will be five 30 min. closed-books quizzes that will contain two problems randomly selected from any previous LonCapa homework, Psets, and classroom problem-solving activities that you had previously solved. The quiz is the best predictor of your final grade; therefore strive to maintain a quiz average 100% and you should have no troubles during the exam. They may be online or inclass.
Exams (2): Midterm (TAB) and Final (June 15 & 16) If you successfully complete all your activities on a weekly basis, you ask questions, you practice working through problems using multiple vocabulary representations and you work LOTS of problems, you will be prepared for the exams. Midterm will be scheduled when we are ready, and the class will agree on the time and date.	40%	The cumulative Final Exam Thurs June 16 during lab time.. The exams will consist of problems that have the same format as the problems that you'll solve throughout all the activities of this course. The level of difficulty is comparable to Level 3 of LON-CAPA problems and Psets problems. An equation sheet will be provided and your calculators is welcome for the midterm and final exam. The FINAL conceptual exam will be on Wed June 15 th during regular class time. No calculator or notes will be allowed for the conceptual exam.
Discussion Board Posts in LONCAPA You will be required to post at least three substantive physics content posts regarding problems and/or text material in the LONCAPA discussion board. You should engage each other in discussions about the physics; answering each others questions relatively thoroughly will constitute substantive posts. "yo, watch this you-tube clip" is not a substantive video clip... unless you also discuss why and what you are hoping others will get out of it regarding physics!	5%	Posted in LONCAPA in "discussion" at the bottom of unit pages. 3 required substantive exchanges for EACH Unit (8 of them) 1. Newton's Laws, 2. Interactions and Forces, 3. Applying Newton's Laws, 4. Describing Motion, 5. Core Models and Planar Dynamics 6. Applying SIM to Problems in Planar Dynamics 7. Momentum and Multi Body Systems 8. Mechanical Energy and Work (we may cover other material, you are required to post for these 8 units.)

Homework in LONCAPA (each unit) and ANGEL assignments These problems are designed to have you work independently when you can and collaboratively when you can. LONCAPA will let you know immediately if you are correct or not. Your participation in the discussion board will be very valuable. The thoughtful discussions and shared resources will broaden your understanding and contribute to better resources for students like you. Thank you in advance!	15%	LONCAPA activities This homework may open before we discuss the corresponding unit in class, but it will always close after we finished discussing all the relevant material. Within each set the problems are structured in three levels (Level 1 being the easiest). Level 1 problems are worth 1 point, Level 2 problems are worth 2 points and Level 3 problems are worth 3 points. The required number of points for each set is 15 points. You can complete the required points using problems from any level. The exam problems will be as difficult as Level 3 problems. You are encouraged to work all of the LONCAPA problems until you get them correct. Or at least work them and discuss them with each other. The assignments posted in ANGEL will have due dates and you are encouraged to discuss them also. These will include WORKBOOK problems and a variety of ways post /turn in your work.
Problem-set (PSETs) assignments : these constitute paper and pencil problem solving requiring you to integrate and apply strategies, physics vocabulary, analysis and conceptual understanding.	10%	For each unit you will also get Psets that you need to solve on paper. You have to bring them in class at the corresponding deadlines (TBA).
Written Self Evaluation: MUST include a self-grade on percent scale. Due at end of quarter: June 17th, before 5 pm.	5% = your self grade	Essay: discuss YOUR learning. Your improvements, your “ah-ha” moments, challenges overcome. Include recommendation to yourself for the next time you study physics.
Laboratory Work: Not a traditional science lab. Plan on spending all 3 hrs actively thinking, discussing and testing out your thinking. Lab materials available in ANGEL>Lessons>Labs folders.	20%	PreLabs (10pt): required for admission to the lab. Print the prelab, work it out, turn it in at the beginning of the lab session. Lab Packet (40pt): will be completed mostly in the lab, with a variable completion time outside of lab. Completed and due at the start of the NEXT lab session. (No other lab write-up required unless requested for specific lab. TBA) Lab HW (20pt): will be available after lab day, due completed at the start of the NEXT lab session.

Approximate Overall grades based on course averages: **A** = 90-100%, **B**= 80-90%, **C**= 70-80%, **D**= 60-70%.

More details....

Some RULES of the ROAD.... How to get along with your Physics Department.

Behavior Expectations: A proactive, honest, self-reflective, disciplined attitude will help you succeed in this course. My assumptions are that you are all persons of the utmost personal integrity; you are respectful of each other, the instructor(s), the equipment and the place. I also assume you want to learn, are willing to work hard and understand that you are responsible for your effort, perseverance and motivation. Because we are a diverse group of learners, each with strengths to contribute to our work together toward a common goal, the standards of civil behavior, academic honesty, tolerance and open minded inquiry are required. You are encouraged to review the WCC College Policies and Student Rights and Responsibilities in the 2010-2012 College Catalog (p. 162-170). In particular, “student responsibilities” include disciplinary actions for intimidation or interference upon another person; disorderly, abusive or bothersome conduct that interferes with the rights of others or obstructs or disrupts teaching or research; failure to follow instructions, thereby infringing on the rights and privileges of others; providing false information; sexual harassment; malicious harassment because of a person’s race, color, religion, gender, sexual orientation, ancestry, national origin, or mental, physical or sensory disability; damage to any college facility or equipment, unauthorized use of college equipment and supplies; possession or use of firearms, or substances

that can be used to inflict bodily harm or damage to real or personal property; smoking; using, possessing or being demonstrably under the influence of controlled substances including alcohol; violation of the acceptable use rules regarding computers and other technology on campus; criminal law violations and ethics violations. Further, disciplinary action will be taken for academic dishonesty and classroom conduct that interferes with the effective cooperation of the class in fulfilling the objectives of the course.

What disciplinary actions in Physics&223? First I will try to use all of my social skills to discourage aberrant behaviors as they arise in public. Usually I try humor, cajoling, maybe collegial teasing, or simple cautions or requests. If the student does not respond appropriately, then I will address the issue with the individual outside of class, I will document the discussion and send it to the Vice President for Student Affairs. *If there is one more incident of inappropriate behavior I will exclude that student from attending class,* which initiates conduct proceedings with the VP. *If the incident involves dishonesty,* any work which would be submitted involved in the incident will not be accepted or reviewed, and a zero will be recorded. *If the incident involves an aggressive and threatening attitude of noncooperation,* then the student will be excluded from my course, and conduct proceedings with the VP will be initiated. *If a student complains about the behaviors of another student,* each situation will be evaluated in private, and generally will result in a follow up conversation with the students involved. If a student complains the VP of Student Affairs office, due to privacy issues, I may or may not be informed and may not be party to a remedy.

My requests: Please come to class before class starts. Have your paper and pencil ready when it is time for the class to start. Turn your cellphones volume off, join a group of students and be willing to mix it up if there are groups already formed as you come in to the classroom. Please communicate in advance if you must miss class; there will be no makeup remedy so you will have to get in touch with a classmate to find out about the activities of the day that you missed. Please make an effort to get to know the names of your classmates; it is the first act of respect to learn one's name. Please do not feed my service dog Emily. She will gladly be your friend, but she does not get food while she is working at school from anyone other than myself. If you do not want to "friend" Emily, and she is choosing you and your bag for napping, please gently shoo her away with "No!" and she will learn. I will be on the alert to keep her away if you are annoyed. She accompanies me about 100% of the time when I am at school, so there is no way to avoid her presence. But you do not have to put up with any of her overtures if you don't want to.

PLEASE ASK FOR HELP OF EACH OTHER AND MYSELF. We are our strongest support in studying physics. I am dedicated to helping my students... so make an appointment, send me an email (sjulin@whatcom.ctc.edu), drop in anytime you see me, come by the regular office hours for our courses: MWF 12:30-1:30, or appointments

IF YOU HAVE ISSUES. Please try to settle your "issues" with each other without my intervention. Certainly if your efforts get you nowhere, then do seek out some assistance. If you have issues with the course or me, **PLEASE** c talk with me as SOON as possible. I am interested in who you are, what you are struggling with and how I can help you. I have a strong personality, often quite irreverent and very casual with high levels of respect assumed at all times. If you feel uncomfortable with something you think I can change or something you think I really should change, please come and talk with me. I look at our relationship as one where my job is to challenge you, challenge you and challenge you. I hold the bar high; because I know you can do it. I know this is a hard course, I know it is hard to work, go to school, borrow money, have a family, try to get back into the groove of "school" after years out or years away, or being in the military or from another country or after having lost a job. We are all under some pretty challenging pressures; so the more I understand about you and the more you understand me, the smoother and better will we work together. I really really look forward to working with my students... everyday. I try to have a laugh every day, I try to enjoy my mistakes and learn from them. I do not look at your mistakes as a "weakness", rather as an opportunity. I mean it... you will see me take delight when I get corrected! I want to know stuff, so it is exciting to get a kink in the path smoothed out! I hope to smooth a bunch out for you... although I know it will feel more like I am throwing problem after problem at you. When you have had enough, you need to let me know!! I cannot guess what is going on inside you.

Ps. This is a complex evolving course... because you are involved in a creative process, I thank you in advance. I expect we will all stumble and get confused and forget something... be patient with the process, always ask questions if you are uncertain or confused. Don't ask the questions that you can really answer yourself... like "where is the stapler", "what is the deal with the LONCAPA discussion board assignment?" etc.. But do ask questions (of each other too) about the process, your progress, the physics. We are a small enough group that we should be able to have quite a bit of fun doing this together if we help and respect and honor each other as serious members of our learning community. WELCOME!!!! I am excited to work with you all this quarter, and I am a bit nervous!

Sara