

Syllabus
Studio Calculus/Physics
Fall 2004

Math 425H and Physics 407H

Instructors:

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Overview of the course:

This course is a combined Physics and Calculus course which satisfies both the General Physics I (PHYS 407) requirements and the Calculus I (MATH 425) requirements. You must be registered for both these courses. This course is also offered through the honors program.

This course covers the same material as any typical college, freshman level calculus-based physics and physics course. One overarching idea in both courses is change--how do we describe and work with values manipulate quantities (position, for example) that are constantly changing? The other idea is that of superposition--we can describe complicated phenomena by subdividing it into smaller, simpler pieces, then summing the effect of those pieces to get the full effect. These two ideas are related in that we can obtain the total change by adding up the effect of smaller variations.

In particular, the topics we cover in this semester are the description of motion, forces, momentum and energy, inertia, torque and angular motion. For calculus, the topics covered this semester include functions, derivatives, anti-derivatives, Riemann sums and integrals, the fundamental theorem of calculus, differential equations, and optimization.

One major difference in this course from standard introductory courses in physics and calculus is that we will use differential equations--equations that contain derivatives and cannot be solved with simple algebra techniques. These equations naturally arise in

physics because they describe how quantities (e.g., position) change in time. We will learn a few techniques to solve some important problems.

The format of this class is also quite different compared to the standard MATH 425 – PHYS 407 sequence. We meet five times a week for two hours each day. Each class is a mixture of short lecture, group activities, computer work and experiments (some short, some longer). There is no separate recitation or laboratory meeting. The class size is approximately twenty students.

Goals:

We have two main goal for this course:

1. Improving of your ability to understand and use the concepts of change and superposition
2. Improving of your ability to solve complex, "real-world" problems

In addition to these main goals, we have several secondary goals. At the end of the academic year you should have significantly improved your ability to:

1. carry out essential operations (e.g., taking derivatives and adding vectors),
2. reason logically and defend your ideas,
3. learn on your own,
4. work in groups,
5. apply physics and calculus concepts to a wide range of situations.

Expectations:

We expect that you, the students, will:

1. **spend at least 10 hours a week outside of class** on these two courses. We will discuss throughout the course ways to make the best use of these ten hours.
2. **attend all classes** (unless you are ill or dealing with an emergency). Class activities are more than reviewing the book. The classroom experience will be difficult for you to duplicate on your own.
3. seek help when you need it. If you find you are having academic or personal problems, please seek help from us or other resources (e.g., your friends, the counseling center, other tutoring resources).
4. be as concerned with the method of finding a solution to a problem as with finding the

answer. We will not give you full credit for simply a correct answer, you must provide a correct explanation as well.

5. begin to evaluate your own work. For example we will expect you to be able to decide if your answer to a problem is plausible and if your strategy to solve the problem is appropriate.

What can you expect from us?

1. Classroom activities that help you think deeply about the calculus and physics.
2. Our guidance as you work through the material, while we will give by asking useful questions rather than by immediately giving answers.

Technical details:

1. **Prerequisites:** Successful completion of high school physics and pre-calculus.
2. **Calculus Textbook and Class Packet:** The textbook used in the calculus portion of the class is *Calculus of a Single Variable* by Stewart. In addition, the calculus activities are in a class pack that you purchase at the print shop in the MUB. You must do this before your first calculus class.
3. **Physics Textbook:** The textbook is *Fundamentals of Physics*, 7th edition, by Halliday, Resnick and Walker, published by John Wiley.
4. **Physics Lab Fee:** You have been charged a \$30 lab fee for physics. This covers the cost of photocopying, of the book. Tutorials in Physics, use of the web-based homework program, and the purchase of the lab equipment and computers.
5. **Schedule:** An approximate schedule of topics, as of the beginning of the semester, can be found on Blackboard. The exam dates have not been set yet but will be set this week, except for the final exam. We recommend that you have a calendar marked with all your major commitments and deadlines (e.g., tests from all classes, due dates for big projects, etc.) to help you budget your time. Do not make plans to leave town at the end of semester until we can establish a date for the final exam.
6. **Honors Credit:** This is an honors course that we are pleased to also be able to offer to students not in the honors program. If you join the honors program at a later date, you can petition for these two courses to be used to fulfill part of your honors requirements. Any student who takes this class and gets a grade of B– or better will get honors credit for this course, even if they are not in the Honors Program.
7. **Snow days:** When inclement weather closes the University for an entire day, the missed day, either calculus or physics, will be rescheduled, perhaps on an open Friday. If

the weather is bad, but not bad enough to close for the entire day, the University will open late, typically at 10 am. In this case, only calculus or a calc/physics day will be affected, and in particular, Section 1. Please attend the remainder of the class, i.e., 10-11 am. In this time the instructor can get the essentials across to you that you will need to do your homework.

Grades:

1. **Is this one course or two?** In terms of grades and credit, this is two courses. You will be given two different grades (a math grade based on math homework, math content of tests and projects, class participation during math classes; and a physics grade based similarly on physics work). It is possible to pass only one part of this course. Two classes during the week will focus on calculus and two will focus on physics; the Friday classes will be both, unless we must reschedule for snow days.

2. **Grading Schemes:** Approximately half of your grade is based on work you will be doing in collaboration with others: class participation, homework and the project. A consistent effort throughout the semester is essential for success. The other half is based on the tests and the final where you show what you can do on your own.

3. **Class Attendance:** Class attendance is critical. During class we will be doing many group projects to build conceptual understanding, facility with operations, and problem solving skills. Interacting with other students and with instructors is a powerful skill to develop, thus attendance is recorded and graded.

For each class you miss, 0.5 points will be deducted from your final grade, up to a total of five points. Absences will be excused (no points taken off) for legitimate reasons (e.g., family emergency, illness). Whatever the reason, a phone call or email at the earliest possible time is expected.

4. **Group Work:** Approximately once per week we will collect and grade work done in class by your group. This homework will be graded on a scale of 4, judged on how well your group meets the assignment goals.

5. **Homework:** In general there will be one calculus and one physics homework each week. This homework will contain both conceptual and quantitative questions. For physics, you will be given homework assignments on Webassign, that you will complete electronically and assignments to be done on paper to be handed in. The hand-in homework is especially important because it will be much like the questions on the exams and it will exercise your ability to solve a problem starting from a blank sheet of paper, where you will be expected to articulate the approach and method that you use and justify your answer, as well as compute the answer. Many of these problems will have algebraic rather than numerical answers. The Webassign homework is more in the form of drills and simpler exercises. The physics hand-in homework will be due on Thursdays,

while the Webassign homework will be due early evening on Wednesdays.

Late homework is not accepted. This is necessary so that we can quickly grade and provide you feedback. If you do not have time to do the entire homework assignment, we recommend that you turn in what you have at the due date. It is far better (both for your grade and your understanding) to do part of the homework, rather than doing it all poorly or skipping it entirely. We advise that you begin to work on the homework assignment as soon as the material is covered in class.

The homework given in math classes will only count toward the math grade; the homework given in the physics classes will only count toward the physics grade.

For some of the physics homework, we will also be using WebAssign, a web-based homework system. WebAssign will grade your homework and give you immediate feedback. For those without the experience you will be given a separate sheet about WebAssign and how to use it.

6. **Exams:** will be given about every four weeks and will take two hours (see the schedule for dates). There are a total of three of these plus a final exam. The final exam is comprised of two parts and counts as two exams. The test questions will be taken from homework, labs, and lectures. There will be roughly an equal weighting between conceptual and quantitative questions. Some of the questions will be straightforward applications of what we have been studying, others will require a deeper understanding of the material. For the physics part of the test, one quarter of the test is based on the conceptual tutorials that we will be doing in class.

The exams will be a mixture of math and physics questions. Some questions will be purely math or physics, will be marked as such, and will only count for that course grade. The more complex questions will be a mixture of math and physics and will be marked accordingly. They will count toward both grades. Each test will therefore have both a math and physics grade.

Makeup tests are allowed in the most exceptional circumstances, but only for legitimate reasons (e.g., family emergency, illness). If possible, you must inform us beforehand.

7. **Questions about grading:** Questions about grading on either tests or homework should be submitted to us within three working days of the return of the work. It is best if you write down the question and attach it to your graded work, otherwise we are likely to forget the details of your question.

8. We do not scale grades in this class. It is possible, for example, for everyone to get an 'A'.

9. **Exceptions:** For legitimate reasons, such as illness, you may not be able to complete your work on time or take an exam. In that case, contact one of us as soon as possible.

You can e-mail or call our work phones any time of day.

Resources:

10. **Blackboard Course Website:** Calculus/physics has a course website at <http://blackboard.unh.edu>. Details about accessing Blackboard are given on a separate sheet. We will use Blackboard for communication: we can post announcements, assignments, old tests, documents such as this syllabus; we can e-mail the entire class or individuals, you can e-mail each other. There are also discussion boards and chat rooms that you may find useful. There is also a calendar to follow important dates.

11. **Office Hours:** Office hours will be arranged and announced the second week of class. They will be posted on Blackboard. Please feel free to come speak to us about any academic questions, to discuss how the class is working (or not working), or anything else of concern to you. You can always arrange a time to meet with us if you have difficulties finding time during office hours. 12. **Work Sessions:** We will also set up times and places where students and instructors can get together informally to work on homework.

13. **Physics and Mathematics Offices:** The physics department office is in DeMeritt 105 (862-1950). The Administrative Manager is Katie Makem and the Administrative Assistant is Rosemary Raynes. The mathematics department office is in the basement of Nesmith Hall (862-2320). The Administrative Manager is Jan Jankowski. The office staff will handle add/drops, hand out grades at the end of the semester, and are generally helpful with any administrative part of the course. The offices are open from 8:00 am - 4:30 pm, but closed for lunch (12 noon-1pm), Monday through Friday.

14. **Physics Library:** The physics library is located in the basement of DeMeritt Hall (Room 19, 862-2348), the librarian is Erica. Solutions to all homework, etc., will be held on reserve there. In addition, other physics texts are on reserve (e.g., Physics for Scientists and Engineers by Giancoli, University Physics by Young and Freedman, Physics by Serway, and The Feynman Lectures on Physics by Feynman [this is at a higher level than our text, but is very entertaining!]). The regular hours are Mon-Thurs 8 am to 10 pm, Friday 8 am to 4:30 pm, Saturday 1 pm to 5 pm, and Sunday 2 pm to 10 pm. The hours change on holidays, and will be posted outside the library door and on the library web page <http://www.library.unh.edu/>.

15. **Mathematics and Engineering Library:** The mathematics and engineering library used to be located in the middle of Kingsbury on the second floor, but has now a temporary home in New Hampshire Hall (use back entrance from the parking lot).

16. **Tutors:** Several groups on campus offer tutoring services in physics and mathematics: tb-p (phone 862-3101), Society of Physics Students, and Marston House. Once they announce hours, we will pass them on to you. Also, check out the web site for

the Center for Academic Resources (<http://www.cfar.unh.edu/index.html>) for other assistance provided by the University.

17. MaC - The Mathematics Center: The MaC is a place you can go to any time throughout your stay at UNH to get help with mathematics.

If your calculus pre-test results show that you need to brush up on your skills, you can go to the center and you will be given worksheets to help you with your particular difficulties. You can also go to the MaC for general math help, regardless of how you did on the pre-tests. The MaC is located on the bottom floor of Christensen Hall (862-3576). These regular hours are as follows: Mon, Wed 1-9pm, Tue, Thu 9am-5pm, Fri 1-5pm. The MaC is also open on some weekends, be sure to check times.