

**Physics 2111**  
**College of DuPage**  
**Spring 2023 10am**

**Instructor**

Dr Tom Carter

- Office: BIC 3E04A (down the hall from our classroom)
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**Instructor's Office Hours**

- Posted on web page
- Other times can be easily scheduled by appointment.

**Course Description:**

Calculus-based study of classical linear and rotational kinematics and dynamics, including work, energy, impulse, momentum, collisions, gravitation, periodic motion, and wave motion. (Students without a strong high school physics background are encouraged to complete PHYSICS 1201 before enrolling in this course.)

**Required Books**

- Physics for Scientists and Engineers by Tipler (6<sup>th</sup> edition).

**Goals and Grading**

The goal of this course is to able students to have a basic understanding of the physical concepts involved in physics of motion. This includes the concepts of velocity, acceleration, circular motion, work, energy, momentum, rotation, periodic motion and wave motion. A significant amount of emphasis will be placed on the basic concepts involved. Calculations and calculus will be used as a tool to study and learn those concepts. Detailed goals for this course are available on the course web page.

|                                   |             |
|-----------------------------------|-------------|
| Prelectures (top 23) *            | 3%          |
| Checkpoints (top 23)*             | 3%          |
| Post-Class Homework (top 28)*     | 14%         |
| Student Response System Questions | 5%          |
| Labs                              | 9%          |
| Weekly Exams (top 13)             | 15%         |
| Exam (3 at 12% each)              | 36%         |
| Final                             | 15%         |
| <b>Total</b>                      | <b>100%</b> |

|          |   |
|----------|---|
| 100%-90% | A |
| 89%-80%  | B |
| 79%-70%  | C |
| 69%-60%  | D |
| 0%-59%   | F |

The C (satisfactory) student will have a minimal understanding of the underlying concepts of this class and will be able to successfully repeat the calculations previously completed on homework. Scores for these students might be: Homework – 90%, Weekly Exams – 90%, Labs – 90%, Tests/Final – 50%.

The B (good) student will have a firm understanding of the underlying concepts of this class and will be able to extend those concepts to calculations involving new simple situations. Scores for these students might be: Homework – 95%, Weekly Exams – 90%, Labs – 95%, Mid-Term/Final – 65%.

The A (outstanding) student will have a full understanding of the underlying concepts of this class and will be able to extend those concepts to calculations involving new, unique and difficult situations. Scores for these students might be: Homework – 100%, Weekly Exams – 95 %, Labs – 100%, Mid-Term/Final – 85%.

The above grading scale is fixed and will not be curved. Students should be able to calculate their current course grade at any time. I reserve the right to increase the final course grade by one letter based on unusual performance on hourly exams or the final.

The ability to complete your homework (with help) and then repeat those calculations (on your own) is considered the minimum required to pass this course. If you are not completing at least 90% of your homework assignments and your weekly quizzes with an average of at least 80%, please come and see me for assistance.

### **Tutoring/Homework**

The majority of the homework assigned in this class will be completed online although additional problems may be assigned from time to time. The homework assignments can be accessed via the class homepage.

There will be two different types of homework assigned every week.

**Prelectures/checkpoints:** These assignments are due *before* we discuss a topic in class. They are meant to allow us to use our in-class lecture time most productively by ensuring that you have a basic understanding of each topic and that I understand where the class is the most confused.

**Post-Chapter Homework:** These problems will review the key concepts from each chapter. They are a mix of extremely short simple questions and there are normally two per week.

Post-chapter homework assignments are due for full credit on the day shown, but can be turned in for partial credit for the next five days. You will be docked 1% of your grade for every day the homework is late. You need to average 95% on the homework to receive full credit.

**Help with your Homework:** The homework is there to help you master the material and you may use it in any method you like. *I do not consider it cheating for people to do their homework together.* You may work on homework in groups.

There are numerous places for students to get help:

- 1) stop in to see me during my normally scheduled office hours,
- 2) make an appointment to see me at almost any time,
- 3) online (each post-chapter problem has help comments built in),
- 4) see one of the physics instructors in the Math Assistance Area,
- 5) work together with a classmate or members of the Engineering Club ,
- 6) get *free tutoring* from the Academic Support Center (942-3941), or
- 7) get help from any other COD physics or engineering faculty member who are around campus from 7:30 am until 10pm every weekday.

### **Weekly Exam Questions**

There will be a weekly exam the last fifteen or twenty minutes on the day each post-chapter homework assignment is due. The exam will either be one of the homework problems from the assignment due that day or an example we worked in class that week. In either case, the parameters will be changed, some intermediate questions may be asked. Complete calculations will need to be neatly shown with answers circled.

If your average on these quizzes is not at least 80%, it is strong indication that your method of studying or completing the homework is not successful for you. If your average is below 80% after the first three weeks, you should seek assistance with your study habits as soon as possible.

### **Extra Credit**

Students can receive extra credit throughout the year in two different ways.

Method (1): Attend 12 or more of any of the tutoring sessions scheduled by the Learning Commons. There can be either regularly scheduled drop-in tutoring sessions in our lab or unscheduled help sessions at the Math Assistance Center.

An extra credit score allows you to replace your lowest score on any assignment with a perfect one. They may not be applied to tests. Students can receive extra credit for one science event and for tutoring (total of two) per term.

Method (2): If your homework score average is greater than 95%.

### **Student Response System Questions**

The classroom period will normally be 15 to 20 minutes of lecture by the instructor followed by a review question to be answered by the students electronically. If the answer is not clear to the majority of the students, students will briefly discuss the topic amongst themselves and re-answer the question. Points will be awarded for correct answers using the following scale:

- |                                  |                                    |
|----------------------------------|------------------------------------|
| 2/3 or more of answers correct   | (60 points)                        |
| less than 2/3 of answers correct | (60 points)*(fraction correct*3/2) |

A bonus “question” will be answered during the first two minutes of every class. So, if you (a) show up to class on time and (b) answer the questions correctly *after* the discussion, you’ll get all of these points.

### **Reference Texts**

The required text for this class is both complete and inexpensive, although it has very few example problems. For students who would like additional reference material, including example problems or would like to read about each topic from a slightly different point of view, several additional standard texts are on 24-hour reserve at the circulation desk at the COD library. The texts are described in a bit more detail in a link from Blackboard.

### **Tests**

- The tests during the term will consist of 5 to 8 problems similar in length to a numerical weekly quiz problem. You will need to show all your work in a neat and orderly fashion.
- Please do not wear a baseball cap or any other billed hat during your exam.
- If you wish to ask a question during the exam, please just ask it from your seat. Once the exam begins, you should not stand up except to turn in your exam.
- You may not use a cell phone in any manner during the exam.
- You must return both the answer to the questions *and the original question sheet* in order to receive credit.
- Students who need to take the test in unique conditions due to medical conditions should make arrangements with the Center for Access and Accommodations and provide me written notification. the week prior to the test.
- Students will not have access their backpacks and cells phones during the exam. Students worried about being separated from extremely valuable items should not bring them to the exam period.
- Tests must be taken on the day and time scheduled. There are no exceptions.
- In the case of extreme medical or personal emergencies, students may use their final exam score to replace a missed exam. Students are advised not to causally miss a normal exam in order to take this option since it will mean that 35% of their grade will depend on a single exam.

### **Final Exam**

The final exam will be all multiple choice and will cover all the topics from the term, including in lab. The schedule for all final exams is posted on the college’s web page, normally under the “Academics” tab. Students are responsible for checking that schedule to determine the time and day for the final exam. No make-up exams will be given for students who miss the final. Your final exam score can be used to replace your lowest test score.

### **Lab Instructions**

In an effort to save students some money, you will not have to purchase a lab manual for this course. Instead, pdf copies of the lab instructions are posted under the “Labs” link in Blackboard. This means **you will need to print out the appropriate instructions that are posted on online in the correct format.** You will need to come to every lab period with a paper copy the appropriate lab instructions. You may not use an

electronic copy of the instructions.

**Lab Schedule:** The lab schedule is posted on our Blackboard page. Please note that the lab will not necessarily be done in numerical order. Just because we did “Lab 01” in the first week, does not mean we will do “Lab 02” the second week. (We share our lab instructions with other classes and courses.) You need to check the schedule to determine what lab we will be doing each week.

**Printing Lab Instructions:** The instructions are in pdf format which should be easy to print correctly. That said, using odd combinations of cell phones and printer can every once in a while cause some crazy printing. Students are responsible for making sure their printer and computer combine to print the instructions in the correct format.

## **Labs**

The purpose of the labs is not to merely confirm what we learned in class. Although both the lab and the class will cover the same topics, you can think of the lab as an almost completely independent way of learning the material. For most students, some concepts will be clearer in lab, some will be clearer in lecture.

Attendance lab is required. Students missing three or more labs will not receive a grade higher than a C. To be counted as “attending” a lab, the student must be both present in the lab and turn in the pre-lab question sheet.

**Pre-lab Preparation:** Every lab includes some “Pre-lab Preparation” sheets which must be completed *before you begin the lab*. Each pre-lab sheet will be initialed by the instructor at the beginning of the lab. Students who arrive at lab without the pre-lab questions correctly completed or who arrive to lab more than five minutes late will be allowed to complete the lab for half credit.

**In-lab Questions and Graphs:** You must complete all questions on the lab sheets *while you are in the lab room*. Please slow down and think about your results and the questions you’re being asked. You should assume that you will be in lab the full three hour period. At the end of each lab, students should present their data and completed lab questions to the instructor for his initialing. At that time, the instructor may also ask students questions to make sure they understood the meaning of the lab.

**Post-lab Homework:** Each lab has a set homework questions. These are probably the *most important part* of the lab. These questions are related activities you completed in lab and you should take the time to try to make that connection.

**Lab Due Date:** Lab sheets and lab homework are due at the beginning of the student’s next regularly scheduled lab period. Lab reports turned in after this time will not be corrected and will receive, at most, half credit. Students are strongly advised to arrive at the lab period with the lab homework done and the lab material neatly removed from the manual. Urgently trying to rip large number of pages from the manual all at once will result in the pages tearing and 1 point being subtracted from your score.

You must complete that lab assigned on the week assigned during the period assigned and all labs must be completed with a lab partner. If you cannot complete the lab during your assigned period for whatever reason, it is your responsibility to arrange

for a lab partner and to complete the lab during one of the other lab periods that week.

**Lab Grading:**

- 1 point for turning in pre-lab material on time.
- 2 points for attending lab period and turning in lab sheets in an acceptable form (e.g. not torn).
- 2 points for getting the post-lab questions correct.

## **Objectives/Goals:**

Upon successful completion of this course, the student should be able to do the following:

1. Describe the relationships among different units of measure
2. Interpret and explain the relationships among an object's displacement, velocity, and acceleration in multiple dimensions
3. Calculate the effect of external forces on an object's motion using Newton's Laws in multiple dimensions
4. Create and label simple free-body diagrams in multiple dimensions
5. Explain and apply the relationship between work and kinetic energy
6. Calculate the effect of external forces on an object's motion using work-energy methods for both conservative and non-conservative forces in multiple dimensions
7. Calculate the effect of both static and kinetic friction on the motion of an object using both force/acceleration methods and work/energy methods
8. Identify and calculate the different forms of energy in classical dynamics (potential, kinetic, and mechanical)
9. Explain and apply the relationship between impulse and momentum
10. Calculate the effect of external and internal forces on a system of objects using impulse and momentum methods in multiple dimensions
11. Identify situations in which a system's momentum is conserved
12. Predict the motion of a system of particles using center-of-mass methods
13. Formulate the outcome of collisions of particles in both elastic and inelastic cases
14. Interpret and explain the relationships among an object's rotational displacement, velocity, and acceleration in multiple dimensions
15. Create and label simple free-body diagrams for rotational situations
16. Formulate the effect of external torques on an object's motion using Newton's Laws in rotational form
17. Identify and calculate the strain of a solid for different applied stresses (tensile, hydraulic, and shearing)
18. Calculate gravitational forces and fields among systems of particles using superposition and integral methods
19. Calculate energies of orbits
20. Calculate kinematical characteristics of an object undergoing simple harmonic motion using the equations of motion for force, position, velocity, and acceleration
21. Describe the relationships among wavelength, period, frequency, angular frequency, angular wave number, and wave speed for a sinusoidal wave
22. Formulate the kinematical characteristics of a sinusoidal wave based on data in both graphical and numerical form
23. Interpret the motion of a sinusoidal wave and explain the superposition principle
24. Calculate the resonant frequencies and wavelengths for both transverse and longitudinal waves
25. Apply the superposition principle to calculate positions of maximum destructive and constructive interference for waves
26. Calculate sound wave intensities and intensity levels
27. Calculate Doppler shifts and beat frequencies

## **Misc.**

**Cheating:** Anyone caught cheating on a quiz or test will receive 0 points for that exam and all exams that follow it.

**Sleeping in class:** Students sleeping during class will be asked to leave the classroom for the rest of that period.

**Test/Quiz Makeups:** All quizzes and tests must be taken on the scheduled date. There will be no makeups.

**Information on Blackboard Page:** Students are responsible for checking the Blackboard site for information including the scheduling of labs and tests.

**Orderliness:** It is the responsibility of the student to turn in all tests, quizzes and homework problems sets with calculations shown in a neat and orderly fashion. If the logic of any calculations full credit will not be given. The final answer for any calculation must be circled and obvious.

**Evaluation of methods:** The physics discipline routinely evaluates its teaching methods by comparing the results from student surveys and standardized tests. These comparisons may be displayed at educational meetings and conferences after all information identifying specific students has been removed. At no time will a method be evaluated which is not considered in the best educational interest of the student. If you have any questions about these evaluations, please feel free to contact me.

**Unannounced 10-point exams:** I reserve the right to give up to six 10-point exams per term without prior notice. As with all other exams and quizzes, there will be no makeups available.

**Incomplete Policy:** A grade of INCOMPLETE may be granted in extreme medical or personal situations during the final three weeks of the term for those students who have remained active in the class and who have a total score of 70% or higher at that point. Contact the instructor for details.

**Laptops:** No laptop computers may be in use at any time during the class period. Student wishing to take notes using a computer may use tablet or iPad-like computer with a writeable horizontal screen.

**Weekly Quizzes:** The number of weekly quizzes may vary slightly due to unforeseen schedule changes. If the number drops below the number counted, I will slightly alter the grading scheme appropriately.

**Checkpoint Questions:** Answers to the checkpoint questions should be reasonable and display student effort in order to receive credit. Answers such as “I just guessed” are not acceptable for credit.

**Turning in material:** Students required to turn in all material (e.g. quizzes, labs) at the designated time and place. Material turned in at other times (e.g. handed to the instructor in the hall) may not be included for full credit.

**Backpacks and phones during exams:** - Students will not have access their backpacks and cells phones during the exam. Students worried about being separated from extremely valuable items should not bring them to the exam period. It is considered cheating for students have a cell phone or any other photographic item during the exam. Should a student need to monitor their cell phone during the exam due to an emergency situation, they may hand their cellphone to the instructor who will monitor it.

**End Time for Tests and Quizzes:** Students must turn in tests and quizzes at the end of the allotted time period. Material turned in after the clearly announced end of the allotted period will not be accepted for a grade.

**Administrative Withdrawal:** After the deadline, students will be required to appeal for late withdrawal and provide appropriate documentation to the Student Registration Services Office for all requests. Students who are granted approval to withdraw by petition will not be eligible for refunds of tuition or fees and will receive a 'W' grade on their transcript. Appeals must be submitted prior to the designated final exam period for 16-week classes and before the last class meeting for all other session classes.

**General Policy:** This class will abide by the all policies of the College of DuPage, specifically including academic honesty and the awarding of incomplete and withdraw grades.