

## PHYS 2420 Introductory Mechanics (CRN 26361) with Open Educational Resources (OER)

This document last updated: January 26th, 2021

### History of changes:

Added MLC group session and one-on-one tutoring schedule (January 26th)

Added TA office hours (January 26th)

Term: Spring 2021

Lecture: TR 12:00 pm – 1:20 pm ONLINE using Microsoft Teams (url at the end of this document)

Workshops: R 8:30 am – 9:20 am (CRN 24875) (TA: Michel Luna)  
R 10:00 am – 10:50 am (CRN 20823) (TA: Michel Luna)  
R 11:00 am – 11:50 am (CRN 24877) (TA: Vanessa Martinez)  
M 10:00 am – 10:50 am (CRN 23876) (TA: Vanessa Martinez)

MLC: Group session: M 12:00 pm – 1:00 pm (Tutor: Blanca Rangel)  
Group session: R 4:30 pm – 5:30 pm  
Group session: F 10:00 am – 11:00 am  
One-on-one tutoring (with appointment): MW 10:00 am – 11:00 am  
One-on-one tutoring (with appointment): TR 3:00 pm – 4:00 pm  
One-on-one tutoring (with appointment): F 9:00 am – 10:00 am

Prerequisites: MATH 1411 may be taken concurrently.  
I do not use capriciously complicated integrals and derivatives in this course. That being said, physics is about finding patterns and relationships in nature, and the most economic and enlightening way of expressing these is with calculus.

Instructor: Jorge Muñoz

E-mail: jamunoz@utep.edu

Office hours: By appointment (<https://jamunoz.youcanbook.me>)

Note: I was a student at UTEP so I have a jamunoz@miners.utep.edu account. Make sure to email me at jamunoz@utep.edu (without the miners) if you want a speedy response.

TA: Vanessa Martinez

E-mail: lmartinezl@miners.utep.edu

Office hours: M 2:30 pm – 3:30 pm

TA: Michel Luna

E-mail: meluna4@miners.utep.edu

Office hours: R 6:30 pm – 7:30 pm

Lab Coordinator: Karla Carmona

E-mail: kcarmona@utep.edu

Miner Learning Center (MLC) Tutor: Blanca Rangel

E-mail: barangelrod@miners.utep.edu

### Grading Policy

In-class exams 20 points (3 exams, 10 points each, worst score is dropped)

Homework 14 points (14 sets, 10 probs/set, 3 probs selected randomly to grade, 1 point max. per set)

Workshop	42 points (14 sessions, presentation at the end, 3 points max. per session)
Final	20 points
Lab	10 points
Participation	Limited to 9 additional points
Total	There are 115 points in this class and I round up.

A: 90+ points  
 B: 80-89 points  
 C: 70-79 points  
 D: 60-69 points  
 F: 0-59 points

The maximum number of points you can get is 115, so there will be no curve.

**Alternative1** If both the average of your homework score (14 problem sets) and the average of your exam score (3 exams) are equal to or higher than 90%, you will earn an A in the class. In Fall 2019, in a class of similar size, 8 students got an A this way.

**Alternative2** If you get 38 or more points in the workshop, you will earn an A in the class, no need to take the final.

The distribution of grades in relevant sections of PHYS 2420 that I taught shows that a high proportion of students get an A in the course. This gives you opportunities to be wrong, a critical part of learning. (The percentages below do not include students who dropped the class – about 10%.)

Fall 2018	Fall 2019	Spring 2020*
A: 31% of students	A: 39% of students	A: 73% of students
B: 31%	B: 20%	B: 6%
C: 15%	C: 17%	C: 4%
D: 8%	D: 7%	D: 3%
F: 15%	F: 17%	F: 4%
		S: 9%
		U: 1%

\* Atypical due to start of Covid-19 restrictions

Bottom line – this is not going to be an easy class, you will need to put in the time and effort to understand concepts in physics and their applications. My team and I will give you all the support you need, with your effort and ours, you will learn a lot and you will also get a good grade.

### Objectives

In accordance with the UTEP Catalog, in this course you will learn dynamics of particles and rigid bodies using vectors and calculus, conservation of energy and momentum, and kinetic theory. These concepts are foundational in the physical sciences and most branches of engineering and if you are taking this class, chances are you will continue to apply these concepts during the rest of your college career and in your professional career. Putting some effort into this class will pay off.

- 1) You will learn about several physics concepts, how they are connected to each other, and how they are used in the real world. This will happen mostly in lecture.
- 2) You will learn how to setup and solve problems applying concepts and models learned in class. This will happen mostly in the workshop, tutoring sessions, by watching the videos that will be uploaded to Bb, and by doing homework problems.
- 3) You will learn to think scientifically about the world and apply ideas from the class to both experiments and current events. This will happen mostly in lecture and in the lab.

## Textbook

This course uses **Open Educational Resources (OER)**. The required textbook is *Mechanics*, by Ben Crowell, which is distributed under a Creative Commons 3.0 license. This license allows you to download it, copy it, and use in this class free of charge. <http://www.lightandmatter.com/mechanics/>

## Lecture Notes

My lecture notes largely follow the structure of *Physics for Scientists & Engineers: A Strategic Approach* 4th Edition by Randall Knight, so this book is optional to acquire. I post my lecture notes to Blackboard, so the content will be available to you even if you don't have the book.

## Homework

There will be 14 problem sets during the semester, each consisting of 10 problems. The problem sets will be posted on Blackboard on Tuesdays and are due the following Tuesday before the end of the day (refer to the calendar below for the dates, in particular with the intrusion of Spring Break). You ought to upload your homework to Bb for us to grade it as a PDF document. **IF IT IS NOT A PDF DOCUMENT, IT WILL NOT BE GRADED.**

The problems come from Knight, Crowell, and sometimes I invent my own problems. Physics being physics, the concepts are exactly the same in every textbook and at the introductory level, the contents are also largely the same. I encouraged to discuss the problems with peers, TAs, professor, tutors, etc. but the final write-up has to be yours.

Written solutions will be posted shortly after the homework is due and video solutions will be available as soon as the homework is posted.

It is unfeasible to meaningfully grade 1,000 problems every week. So your TAs will each randomly pick three problems to grade. The scheme is 0 points for no work, 0.2 points for work but incorrect answer, and 0.3 points for correct answer and work backing it up. An additional 0.1 points will be awarded if all three problems were at least attempted. This way, the maximum number of points you can get in a given problem set is 1.

**Your best bet for help with homework problems is to go to the Miner Learning Center**, ask Blanca Rangel (the tutor assigned to our course) to help you, and don't "leave" until your homework is finished several hours later. It is advantageous if you have already thought about the problems. During the Fall 2019 semester, one student spent 57.75 hours with Blanca at the MLC, and about 10 more students spent between 10 and 30 hours and they did really well in the class. Some of these students initially struggled with the material, but they all got an A. Blanca is great.

## Videos

We have developed our own **Open Educational Resources (OER)**. Every week I will release a few videos of me solving physics problems that are pedagogical, insightful, and similar to your homework problems. In a big class it is difficult to actually work on problems on the board, but the videos have been well received by the students. You can fast-forward or stop it and watch it when you have time.

Let me know if you want to record the solution to a problem of your choosing. If you share it with the class you will get 5 participation points.

## Exams

There will be 3 exams scheduled during lecture time: on February 18th (kinematics), March 25th (dynamics), and April 29th (work and energy). The exams are designed by the students. I provide the structure for the exam (number of problems, difficulty, topics) and you provide the contents (which problems, concepts, etc. to test with the proviso that problems will not be identical to those in the homework). Everybody has a bad day, so the worst

score will be dropped. Although the material tested on the exams is not rigorously cumulative, new concepts in physics are built on previous ones.

Exams will be available on Bb to download and upload on the scheduled day during the lecture the time. IF IT IS NOT A PDF DOCUMENT, IT WILL NOT BE GRADED.

### **Workshop**

The workshop will be on Microsoft Teams. You will be randomly assigned to a 3-person group and there will be 2 problems for you to work on. The problems will be similar but not identical to the homework problems. You should come prepared to the workshop by having solved the homework problems and ideally having visited your TAs or MLC tutor. You will then record, as a team, the solution to the problem and this will be graded by your TA. The recording should be 5-10 minutes and every member of the team must participate in order for the team to get full credit. To avoid freeloaders, you will be able to anonymously report students who do not pull their own weight and if a student is reported 3 times, I will have a conversation with the student. An instructional video on how effectively communicate a problem solution will be uploaded to Bb.

### **Final**

The final is on Monday May 11th from 1:00 pm to 3:45 pm in UGLC 220 and it is cumulative.

### **Lab**

The lab is independent of the class, but there is synergism. Karla Carmona is the Lab Coordinator. There is 1 laboratory, the one on momentum, that you will have the same week that we see the topic in class, but otherwise the lecture is ahead of the lab.

### **Participation**

It takes time to get good at physics, and time is in short supply for everybody. Before each exam, I will request volunteers to hold student-lead review sessions (5 participation points), and if you attend a student-led review session, you get 2 extra points. The reviews will be on Microsoft Teams. Leads and participants have in the past found this enjoyable and useful, even if online. You can also get 5 participation points for recordings of problem solving that is made available to the whole class.

### **Attendance**

Attending lecture is encouraged but not required. Additionally, the lecture will be recorded and made available for those who prefer asynchronous learning. I value your time and I will try to provide new perspectives and intuition on physics and its role in technology, society, etc. You are paying for this. Attending the workshop has a more direct impact on your grade because of the quiz and because the problems on the exams will be similar to the ones your TA will go over during the workshop.

### **Collaboration**

Discussing the problems with peers, tutors, etc. after attempting to solve them on your own is encouraged, but the work you turn in has to be your own.

### **Winning strategy**

The class is structured so that if you put in the effort, you will learn a lot and pass with a good grade. During the lecture, I will put things in perspective for you (this is the education part). The other part of the class (training) involves the homework and the workshop. You are free to collaborate on the homework and you should take advantage of the resources available to you (tutoring, office hours, Bb videos, dark web, etc.) Ask questions during the lecture (perhaps online is a bit less scary) and during the workshop. If you take your homework seriously, you will do great on the exams. This is your class and your opinion matters, talk to me. Finally, try to enjoy the class. Understanding and exploitation of physical phenomena has revolutionized our way of life in the past few

centuries, but what really attracts me to physics is that it tells us the most about the origin and the fate of the Universe.

Week	Lecture Dates	Notes	Topics
1	Jan. 19, 21		Concepts of motion
2	Jan. 26, 28	HW1 due Jan. 26	Kinematics in 1-D
3	Feb. 2, 4	HW2 due Feb. 2	Vectors and coordinate systems
4	Feb. 9, 11	HW3 due Feb. 9	Kinematics in 2-D
5	Feb. 16, 18	HW4 due Feb. 16 1st exam Feb. 18	Force and motion
6	Feb. 23, 25	HW5 due Feb. 23	Dynamics – motion along a line
7	March 2, 4	HW6 due March 2	Newton's third law
8	March 9, 11 March 15 – 19	HW7 due March 9 Spring Break	Dynamics – motion in a plane
9	March 23, 25	HW8 due March 23 2nd exam March 25	Work and kinetic energy
10	March 30, April 1	HW9 due March 30 Withdrawal deadline April 1	Interactions and potential energy
11	April 6, 8	HW10 due April 6	Impulse and momentum
12	April 13, 15	HW11 due April 13	Oscillations
13	April 20, 22	HW12 due April 20	Rotation of a rigid body
14	April 27, 29	HW13 due April 27 3rd exam April 29	Newton's theory of gravity
15	May 4, 6	HW14 due May 4	Quantum Mechanics in 1-D
16	N/A	Final exam on Tuesday May 11th 1:00 pm – 3:45 pm	

### Missed exams and other eventualities

Since the worse score is dropped, there are no make ups for exams. If you experience a situation that affects your long-term performance in the class, let me know and show appropriate documentation.

### Mentoring

Feel free to approach me for mentoring about your career, research ideas or opportunities, letters of recommendation, etc. I work for you and I like to do a good job, take advantage of that. Also take advantage of your peers. These people go along with you in life.

### Blackboard

All the homework problems (the day they are assigned), solutions (after the due date and definitely before any relevant exams), slides and lecture notes (sometimes before class but not usually), reviews (after the review), videos, and other materials will be uploaded to Bb. You can also check your grades for the different components of the class.

### Students with Disabilities

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to [cass@utep.edu](mailto:cass@utep.edu), or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at <https://www.utep.edu/student-affairs/cass/>. Accommodations might include but are not limited to note takers, readers, or extended time on exams and assignments. Please take care of this as soon as possible and before the first exam.

**Academic dishonesty**

Science is incompatible with cheating, and will not be tolerated. I have sent students to the Office of Student Conduct and Conflict Resolution for the more serious offenses and I do it to protect our learning environment. When cheating becomes widespread, students become discouraged from studying, working on homework problems, etc. because they don't want to earn a lower grade than someone who cheated. And who would? There are enough points in the class to be wrong and make mistakes and learn and still get an A. Just don't cheat. I mean it.

**Lectures**

<https://teams.microsoft.com/l/meetup-join/19%3a1fd7137d94fc44a4bdf427ce1ef80078%40thread.tacv2/1611033044784?context=%7b%22Tid%22%3a%22857c21d2-1a16-43a4-90cf-d57f3fab9d2f%22%2c%22Oid%22%3a%22280d8f68-19ef-41a3-bb5f-16be02f3e051%22%7d>