

**Physics 135-3-04: General Physics (Waves & Optics)**  
**Zoom and/or Tech L221**  
**Lecture: MWF 1:00 – 1:50 pm**  
**(Discussion: Th 1:00 – 1:50 pm Zoom and/or Tech L221)**  
**Spring 2020**

**Taught by:** Prof. Daniel Lascar  
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Office and hours: Wed 4-6 pm  
<https://northwestern.zoom.us/j/111773793>  
Fri 2-4 pm  
<https://northwestern.zoom.us/j/670410110>

**ALL TIMES LISTED ARE LOCAL CHICAGO TIME**  
**(Central Daylight Time [GMT-5])**

**Catalog Course Description:** This is a three-quarter sequence in calculus-based classical physics with an introduction to modern physics in the third quarter. It is intended for science and engineering majors and premedical students. PHYS 135-3 is the third and final section of the 135 sequence in General Physics. The overarching topic of 135-3 is waves in their various forms and manifestations. Specific topics to be covered are: -Mechanical waves -Sound waves -Electromagnetic waves and their applications in geometric optics -Interference and diffraction -Wave-particle duality of quantum physics and its consequences for atomic phenomena. -Special Theory of Relativity  
*Prerequisites: MATH 220-0, MATH 224-0, and MATH 230-0 or equivalent. PHYSICS 135-2 or PHYSICS 125-2 or GEN ENG 205-2,3 or GEN ENG 206-2,3 or equivalent. Concurrent registration in the corresponding quarter of PHYSICS 136-3 (laboratory) is required.*

**Course Goals:** The goal of this course is two-fold. First, you will learn the fundamentals of waves and optics while improving your ability to apply calculus to physical problems. Second, you will develop and/or improve upon the critical thinking, problem-solving, and communication skills that are important to scientists and engineers in all disciplines.

**Lectures and Discussions:** While classes are being held off-campus, lectures will be held via the Zoom video conference software at 1 pm on Mondays, Wednesdays, and Fridays. Lectures will be recorded for later viewing by those that are unable to attend. Discussion sections will be held on Thursdays at 1 pm also via Zoom. Links to all classes and discussion sections will be posted on the class CANVAS page.

If and when classes return to campus then all lectures will take place in Tech L221 at 1 pm on Mondays, Wednesdays, and Fridays. Discussion sections will be held on Thursdays in Tech L211 at 1 pm.

*For those who cannot return to campus after a return is allowed, it is **YOUR** responsibility to get in contact with me as soon as possible so that we can make arrangements.*

**Lecture Recording:** I will be recording and posting all lectures via Zoom. All students registered for the course will have access to these recordings via CANVAS.

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact [AccessibleNU](#). Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's [Copyright Policy](#), faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

**Office Hours:** While we are off campus, official office hours will be held via Zoom Mondays and Wednesdays from 2-3 pm. Zoom office hours allow for both group discussions as well as one-on-one meetings via the “breakout rooms” function. I am also available via appointment. My office phone of 847-467-2823, sends me an email whenever I receive a call as well as a recording of the voicemail so I will be answering my phone virtually as well.

Under normal circumstances I would also mention that I am available if you can catch me in my office but while we are off-campus I am also the primary caregiver for my one-year-old child so I cannot guarantee availability between the hours of 8am-8pm. Thankfully she’s an excellent sleeper so morning appointments before 8:00 am and evening appointments from 8:30 pm onward should have a fairly good rate of success. Her napping in the afternoon, however, is less certain. You are welcome to try to meet with me between the hours of 1pm and 5pm but I can offer no guarantees of success.

If and when we return to campus, my office hours will be held weekly on Mondays and Wednesdays from 2-3 pm. My office is Tech F132. I will also be available by appointment or any other time you catch me in the office. I am available via Skype/Zoom/Microsoft Teams, and email until approximately 10:30 in the evening on most nights. My office phone, 847-467-2823, sends me an email when I can’t pick up so it’s fine to call at any hour. I will get the message.

**Text:** *Fundamentals of Physics*, 10<sup>th</sup> Edition (Extended) by Halliday, Resnick, and Walker. Students are responsible for all readings announced in class.

The text is also on course reserve with a 2-hour loan period at the Main Library circulation desk. It is shelved by call number QC 21.3.H35 2014

**Course Websites:** All links to Zoom classes and discussion sections will be posted via CANVAS. All additional course materials and lecture slides will be posted on CANVAS (<http://canvas.northwestern.edu>). I will also use CANVAS to email the entire class from time to time. As such, it is your responsibility to keep your accounts updated and able to communicate with an email address that you can check on a regular basis. I will send out a test message before the class’ first lecture to make certain that everything is working. If you aren’t getting my emails, you must contact me immediately.

**Class Attendance:** No grade is submitted for class attendance and while we are off-campus there will be no class participation grade (*see grade distribution below*). However, if and when we return to campus there is a component of your grade that will involve class participation (*see below*). Students are responsible for all material presented and all announcements made in class irrespective of attendance. On average, students who come to class get better grades.

**Homework:** I will assign homework problems from the text every week. Homework will consist of 30% of your grade if we are entirely off-campus or 25% of your grade if we come back to campus before the quarter ends. A fraction of those homework problems will be graded for credit but I will not announce which will be graded.

The homeworks must be **generated** and submitted electronically to the CANVAS site. The generations should be made using LaTeX, Microsoft Equation Editor in *Word*, MathML, MathType in *Pages* for Mac, or any other equivalent document creation environment. Attempting to recreate equations using regular text typesetting will not be accepted.

I will not accept scanned, handwritten homeworks. Part of your training as scientists and engineers is the communication of mathematical concepts and, in a world where electronic document generation is the dominant form of document creation, I feel that it is imperative that you learn and refine this skill. A plethora of free and freely available software packages exist to help you accomplish this so you should incur no additional costs. Also, I am happy to help you get started with this software.

Overall, these homeworks are incredibly important, as scientists generally learn physics by solving problems. Physics is not a discipline that demands a great deal of memorization. It is more about applying a small number of rules to a plethora of different situations in order to study and make predictions about them. Thus, the best way to learn how to apply those rules is to **use them**.

Unless otherwise stated, homeworks must be turned in by **NOON** on their due date. Points will begin to be deducted from homework for the following submission times:

- 12:00 pm - 12:59 pm → **2 points off**
- 1:00 pm – 1:59 pm → **4 points off**
- 2:00 pm – 2:59 pm → **6 points off**
- 3:00 pm – 3:59 pm → **8 points off**
- Homework submitted after 4:00 pm will not be accepted or graded.

*It is your responsibility to make certain that homeworks are legible.* If I or the TAs can't determine what you mean then the response is wrong. It is always better to err on the side of writing too much and using more pages.

**Exams:** There will be three exams and a cumulative final. All exams are currently scheduled to be given during the Thursday discussion section. The exams will count for 40% of your grade and the final will count for 30%. Of the three exams, I will drop your lowest score so that your two highest scoring exams will each count for 20% of your grade. Though I reserve the right to change these three dates if we are ahead (or behind), I would tentatively expect the exams to be April 30, May 21, and June 4. I will set a 4-hour window within which you may begin and complete the 50-minute exam.

Anything covered in class can appear on exams. The answer to the questions, “Will this be on the test?”, “Do we need to know this for the exam?”, or any questions along a similar vein is always **YES**.

All exams will be open-book and open-note though you should not need the book. Students should bring a calculator but phones (outside of contacting me or your TA), computers (outside of what you use to access the exam), or any networkable devices are strictly **prohibited**. I encourage you to bring to the exam an equation sheet or notecard. The exams will be multiple-choice in nature, administered via CANVAS with the Respondus LockDown Browser.

**Final Exam:** The final exam will be held on Friday, June 12 at 9 am either via CANVAS or in Tech L221 depending on whether we are on- or off-campus. It will follow all other exam procedures.

**Make-up Exams:** Exams may only be rescheduled in the event of serious illness or personal emergency. Please contact me as soon as you think you may need to reschedule an exam and be prepared to offer documentation sent directly from a medical professional or academic advisor. Contacting me too close to an exam (or after) with an invalid excuse will almost certainly result in a zero for the exam. I am entirely aware of the difficulties and anxieties associated with our off-campus status and I will be as accommodating as I can be but you are still registered for a Northwestern University course and I have a responsibility to you and to this institution to run it with as much rigor as I can.

**Other important dates:**

Monday, May 25      *Memorial Day* – No class

**Class Participation:** Over the course of the lectures I will ask the class multiple choice questions and plan to average 2-3 multiple choice questions per class. If we were on campus, in order to get full class participation credit you must correctly answer 10 of these questions over the course of the quarter. There will be no partial credit given for fewer than 10 questions answered correctly nor will there be extra credit given for answering more than 10 questions correctly.

For every week that we are off-campus, I will reduce the requirement for the quarter by 1 question per week and if we are off-campus all quarter then there is no longer a class participation requirement and the 5% portion of your grade for class participation will shift to the homework portion of your grade.

**Texting in Class:** Off campus – This is not germane. In fact, I encourage the use of the chat function in Zoom due to the nature of the platform.

On-campus – Don't do it. If I catch you doing it I reserve the right to ignore your questions.

**Grades:**

Class participation: 5% (If we have any portion of the course on-campus)

Homework: 25% (30% if we are off-campus all quarter)

Exams: 40% and I will only count the highest 2 out of 3

Final Exam: 30%

Per instructions from the Dean of Weinberg College, all students will be graded on a Pass/No Pass scale:

Pass: 60% to 100%

No Pass: < 60%

Grades will be calculated to 2 decimal places and the final course grade will be rounded to the nearest integer (e.g. 92.50% → 93% and 92.49% → 92%).

**Curves/Extra Credit:** In light of the Pass/No Pass grading scheme, students should know that no curve will be considered this quarter and no extra credit will be considered. Please do not ask.

**Academic Honesty and Group Work:** Northwestern University, WCAS, and McCormick all have academic codes of conduct that students are expected to follow. Any incidence of academic dishonesty on a quiz or exam will result in a grade of "0" and will be reported to both the Chairperson of the Physics Department and the appropriate school dean. The university's Academic Integrity policy, along with the policies of Northwestern's individual schools, can be found here <https://www.northwestern.edu/provost/policies/academic-integrity>.

Personally, it would be a massive understatement to note that I take a dim view of those that would break their academic codes of conduct. Without equivocation, it devalues the work and degrees of everyone associated with this institution past, present, and future. Beyond reporting the dishonesty, I will take any and every action available to me in the Northwestern faculty handbook to pursue and punish the offender.

With that stated, I heartily encourage working on homework and studying in groups. Two (or three or four) heads are better than one and science is, at its core, a collaborative enterprise. I will do my best to encourage collaborative work and facilitate the creation of study groups. However, all assignments (homework and labs) must represent your own work. Copying is simply not allowed.

**Quarter-Long Virtual Study Group Opportunity – Registration Required:** If you would like to study with other students in this class, consider joining a [Peer-Guided Study Group](#). Participants will meet weekly — through Zoom while the University is operating remotely — with about 5 to 8 other students and a peer facilitator, a student who has already taken and done well in the course. During sessions, students review concepts, work through practice problems, bring their questions, and work together to develop answers. This is an excellent opportunity to connect with others in your class while we are physically separated.

Students register for the full quarter on CAESAR and attendance is expected weekly. Study Group sessions are listed on CAESAR below course lecture and discussion sections (ex. CHEM 131-SG – CHEM 131-SG Peer-Guided Study Group: Quantitative Problem Solving in Chemistry). Feel free to contact Borislava at [borislava.miltcheva@northwestern.edu](mailto:borislava.miltcheva@northwestern.edu) with any questions. Provided through [Academic Support & Learning Advancement](#), have no information on how or if it will exist this quarter but I reserve this space for information concerning that resource.

**Virtual Drop-In Peer Tutoring – No Appointment Needed:** Students are welcome to stop by [Drop-In Peer Tutoring](#) — through Zoom while the University is operating remotely — to get support with a specific question or issue, or just talk through course materials with others. Covers many introductory courses in Biology, Chemistry, Economics, Engineering, Math, Physics and Stats. Tutoring takes place Sundays through Thursdays. **Check Zoom links, specific times, courses and locations on the [Drop-In Peer Tutoring website](#).** Feel free to contact Krystal at [krystal.wilson@northwestern.edu](mailto:krystal.wilson@northwestern.edu) with any questions. This is an excellent opportunity to connect with others in your class while we are physically separated. Provided through [Academic Support & Learning Advancement](#).

**Wondering how to lean and stay engaged?** ASLA's [Learning During COVID-19 page](#) has helpful tools and suggestions.

**Accommodations:** Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU ([accessiblenu@northwestern.edu](mailto:accessiblenu@northwestern.edu); 847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.

Student Athletes and other participants in recognized student organizations who have conflicts with exam dates must let me know a minimum of 2 weeks before the exam in question so arrangements can be made<sup>1</sup>.

## Tentative Course Schedule

Week	Subject	Chapter
1 (Apr 6-10)	Oscillation and Simple Harmonic Motion	15
2 (Apr 13-17)	Waves I	16
3 (Apr 20-24)	Waves II	17
4 (Apr 27-May 1)*	Waves III <small>(really just another day of Waves II)</small> and Electromagnetic Waves	17 & 33
5 (May 4-8)	Electromagnetic Waves	33
6 (May 11-15)	Optics	34
7 (May 18-22)*	Interference	35
8 (May 27-29)	Diffraction	36
9 (Jun 1-5)*	TBD	37 or 38

\* Denotes that an exam will tentatively be held on the Thursday of that week

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<sup>1</sup> I recognize that during this quarter this is unlikely to be an issue but I include it for the sake of completeness.