



PHY-190/191

Physics and Engineering for a Sustainable World

Lecture
MTWRF
11:30 am—12:20 pm
Olin Hall 103

Lab
W (1:30—3:20 pm)
R (2:30-4:20 pm)
Olin Hall 224

Course Description and Objectives

This course will provide you with a project-intensive experience and an emphasis on team building and project management skills themed around sustainability and climate change. We will also explore scientific and engineering ethics, and social and environmental justice while introducing fundamental engineering and physics technical topics in the areas of Newtonian mechanics, solid mechanics, thermodynamics, fluid mechanics, and optics.

Student Learning Outcomes

By the end of this class, students will be able to:

- Model, test, and analyze fundamental physical systems in the areas of Newtonian mechanics, solid mechanics, thermodynamics, fluid mechanics, and optics.
- Implement the engineering design process to tackle a real-world problem.
- Incorporate principles related to human-centered design, ethics, and justice into the engineering design process.

- Design, build, and program basic feedback systems using digital logic circuits.
- Apply new skills to project and team management.

What is in this syllabus?

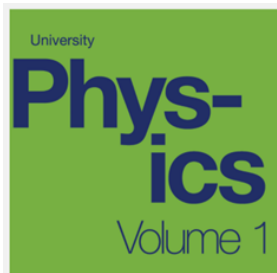
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Materials and Resources

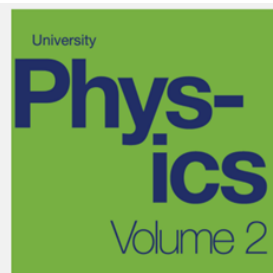


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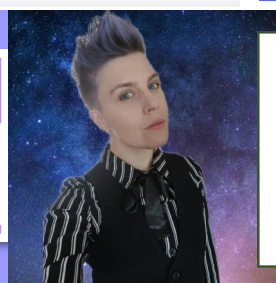
Class Forum



Discord
[Link on Moodle]

Dr. Darsa Donelan
Email: ddonelan@gustavus.edu
Office: Olin Hall 204
Office Hours: TBD (based on when2meet poll)

Hello
my pronouns are
they/them



Open Door Policy:
Stop by my office at any time for discussion on course work or just to have a cup of tea and friendly conversation.

Requesting Accommodations

Gustavus Adolphus College is committed to ensuring equitable and inclusive learning environments for all students. If you have a disability and anticipate or experience barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. Accessibility resources staff are located in the Academic Support Center (<https://gustavus.edu/asc/accessibility/>) (x7227). Accessibility Resources Coordinator, Corrie Odland (codland@gustavus.edu), can provide further information.

Course Requirements

Lecture Attendance and Activities

The weekly class sessions are a main source of learning for the course. Please arrive to class on time and plan to stay for the entire session. There will be various lecture activities throughout the semester that are designed to give you an opportunity to apply the concepts we have been learning in class. I will not explicitly grade attendance. However, periodic assessments will be conducted as Quizzes (see Course Schedule), and you must be present in class to take these. **Moreover, you must actually complete Labs to be able to write them up.** Please try to contact me ahead of time if you need to complete a scheduled Lab at an alternative time.

Laptop policy: All course documents will be posted on the course Moodle site, many of them contain images along with text. Please come to class prepared to take notes. You may use a laptop/tablet in class, but only to take notes or access class material. Do not use your laptop to explore the internet, visit social media, etc. Remember, many individuals are distracted by glowing screens in their line of vision. I may ask that all devices be put away during some class sessions, so please come to class prepared with a pen and paper.

Remote Learning: If you are unable to attend class in person, please join through Zoom. A link will be provided via Moodle and Google calendar. Additionally, all lectures will be recorded and posted to YouTube for an asynchronous learning option.

| | Location | Time |
|--|--|--------------------------------------|
| Physics Lecture Days | In person: Olin 103 Online Option: Zoom [Links to meeting rooms on Moodle] | MWF 11:30 am - 12:20 pm |
| Engineering/ Sustainability/ Life Skills | | TR 11:30 am - 12:20 pm |
| Lab | Olin 224 | W (1:30-3:20 pm) or R (2:30-4:20 pm) |
| FREE! Help Sessions w/ Darsa | Scheduled: Center for Inclusive Excellence | TBD (based on when2meet poll) |
| | Open Door: Olin 204 | When my door is open |
| Tutoring | Olin 216 | Sun-Thurs 7-10 pm |

Assignments

Submitting Your Work

All assignments reviewed for credit should be submitted to electronic dropboxes via Moodle.

Late Assessments and Deadline Extensions

Life happens, but keeping to deadlines is also good practice. To honor both of these facts, I am instituting a policy in the middle: assignments will be due as specified when assigned, but you may have two (2) no-penalty 24 h late submissions and one no-penalty 48 h late submission. Only one student's pass should be used for each late group submission. Separate accommodations will be made for Quests. Please remember to indicate with your electronic submission if you are using a late submission pass.

Academic Integrity

While I absolutely encourage you to work together and to consult additional educational resources, please remember ultimately to do your own work. The goal is for you to learn how to use the equipment and software, and to improve your technical communication skills. I will not award credit for any work that appears to be copied, whether from another student or a solution manual published to the internet. The initial infraction will incur a penalty of "0/3" on the assignment. A repeat infraction will incur a subsequent penalty of "0/3" and an Honor Code violation report to the Provost's Office.

For more information, please review Gustavus's policy on academic integrity (https://gustavus.edu/general_catalog/current/acainfo).

Help & Resources

1. Multilingual Student Support

You can find support through the Center for International and Cultural Education's (<https://gustavus.edu/cice/>) Multilingual and Intercultural Program Coordinator (MIPC), Pamela Pearson (ppearson@gustavus.edu). Pamela can meet individually for tutoring in writing, consulting about specific assignments, and helping students connect with the College's support systems.

2. Mental Wellbeing

If you or someone you know expresses mental health concerns or experiences a stressful event that can create barriers to learning, Gustavus services are available to assist you, and include online options. You can learn more about the broad range of confidential health services available on campus at <https://gustavus.edu/counseling/> and <https://gustavus.edu/deanofstudents/services/>.

3. Title IX: Sexual Misconduct Prevention and Resources

Gustavus Adolphus College recognizes the dignity of all individuals and promotes respect for all people. As such, we are committed to providing an environment free of all forms of discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available; you can learn more online at <https://gustavus.edu/titleix/>.

Grading

| Type of Work | Description | Evaluation |
|-----------------------------|--|-------------------------|
| PHY-190 (Lecture) | | |
| Assignments (40%) | Homework “Assignments” will generally include a list of questions on the related topic that require either thoughtful qualitative or thorough quantitative responses. To receive a 3, quantitative responses must include written annotations. To earn all 40%, you must receive 3’s on a “majority” of the assignments issued in the course. | 0-3 scale (holistic) |
| Quests and Final Exam (60%) | We will have three (3) in-semester Quests and one (1) final exam this semester. Each will be worth 20% of your course grade, and I will automatically drop the lowest score of the four (thus, totaling 60% of your course grade). Each problem will be individually assessed out of 3 points and then weighted according to the structure specified on that assessment, for a final score out of 3 points. | 0-3 scale (weighted) |
| PHY-191 (Lab) | | |
| Lab Completion (50%) | “Lab Completion” will be scored on two aspects: (1) completing the lab and (2) thoroughly documenting your work (both in lab and in your write-up). Twice this semester, I will review your individual lab notebooks to provide feedback on your documentation practices. All labs will be weighted equally, and I will automatically drop your lowest lab completion score. | 0-3 scale (holistic) |
| Design Project (50%) | You will also undertake a group-based engineering design project this semester. Please see the “PHY 190 - Engineering Design Project” guide on Moodle for more details on the assessment structure. | 0-3 scale (weighted) |

Scale

Most work will be reviewed on a 0-3 scale.

Final Grade

Your final score on the 0-3 scale will be determined according to the weighted percentages in the left-most column of the table above.

Final Grade:

| | | | |
|-----------|----|-----------|----|
| 2.75-3.00 | A | 1.75-1.99 | B- |
| 2.50-2.74 | A- | 1.50-1.74 | C |
| 2.25-2.49 | B+ | 1.00-1.49 | D |
| 2.00-2.24 | B | < 1.00 | F |

Grading Scheme

Score

Very thoughtful and well completed work.

3

Sufficient.

2

Lacking depth/quality.

1

Did not complete.

0

I have the right to adjust thresholds should this system prove too lenient or harsh in practice.

Course Schedule*

| Week | Monday M | Tuesday T | Wednesday W | Thursday R | Friday F | Lab Ses- sion |
|----------------|------------------------|--------------------------------|-------------------------------|--|-------------------------------|--|
| 1 / Sep 5 | No class | Course intro. | Sensors & Arduino | Sustainable design | Scavenger Hunt | Design activity |
| 2 / Sep 12 | Newtonian mechanics I | Creativity & design thinking | Newtonian mechanics I | Climate change science | Newtonian mechanics I | Greenhouse gases |
| 3 / Sep 19 | Newtonian mechanics I | Project pitches | Newtonian mechanics I | Engineering grand challenges | Solid mechanics | Ask & Imagine |
| 4 / Sep 26 | Solid mechanics | Study skills & Time mngt. | No class - Nobel Conference | No class - Nobel Conference | Solid mechanics | No lab - Nobel Conference |
| 5 / Oct 3 | Quest 1 Review | Teaming & project mngt. skills | Quest 1 | Landfill & Cradle-to-cradle | Newtonian mechanics II | Solid mechanics |
| 6 / Oct 10 | Newtonian mechanics II | Scrum, Gantt | Newtonian mechanics II | Sustainability at Gustavus | Newtonian mechanics II | Plan (ctd.) |
| 7 / Oct 17 | Newtonian mechanics II | Feedback & critique | Thermodynamics I | Energy futures & Decision making | Thermodynamics I | Design review |
| 8 / Oct 24 | No class - Fall Break | No class - Fall Break | Thermodynamics I | Stress & Resilience | Thermodynamics I | Thermostat |
| 9 / Oct 31 | Quest 2 Review | Conflict resolution | Quest 2 | Tiny houses & Energy consump. | Fluid mechanics | Create & Test |
| 10 / Nov 7 | Fluid mechanics | Voltage & circuits | Fluid mechanics | Self-driving cars & Ethical frameworks | Thermodynamics II | Solar powered pump |
| 11 / Nov 14 | Thermodynamics II | Voltage & circuits | Thermodynamics II | Choking under pressure | Thermodynamics II | Improve |
| 12 / Nov 21 | Optics | Motors | No class - Thanksgiving break | No class - Thanksgiving break | No class - Thanksgiving break | No lab - Thanksgiving break |
| 13 / Nov 28 | Quest 3 Review | Binary & logic | Quest 3 | Project presentation planning | Optics | Optics |
| 14 / Dec 5 | Optics | Self- & peer-reflection | Optics | Guest speaker panel | Optics | Share |
| 15 / Dec 12 | Final Review | Project showcase | Course wrap-up | | | Final Exam Saturday, Dec. 17 10:30 am - 12:30pm |

***I reserve the right to revise at my discretion.**

Communication

If you have any general questions about the course that are not answered in this syllabus, please post a message under the #class-discussion or #general-chat channel in the course Discord. To discuss any individual issues with me, it is best to visit office hours to speak to me in person. You can also direct message me over Discord or by email.

Website

The course website can be found through Moodle (<https://moodle.gac.edu/>). The website includes access to course documents and links to course Discord forum and the course blog site.