Syllabus: PHY 183 – Sections 3, 4 & 5 Spring 2025

Mechanics Projects and Practices in Physics (P-Cubed)

Class Meetings:

Section 003	10:20 am – 12:10 pm (Eastern Time) Tuesdays & Thursdays
Section 004	12:40 pm – 2:30 pm (Eastern Time) Tuesdays & Thursdays
Section 005	3:00 pm – 4:50 pm (Eastern Time) Tuesdays & Thursdays

Modality
Class meets in person unless university guidelines change.

Credit Hours: 4.0

Instructors:
Richard Hallstein (sections 3 and 4)
Pronouns: he/him/his
Office Hours in help room Time/LOC: Wednesday 4-5PM or by appt
Email: hallstei@msu.edu

Prof. Rachel Henderson (section 5)
Pronouns: she/her/hers
Office Hours in help room Time/LOC: Monday 4-5PM or by appt
Email: hende473@msu.edu

Teaching Assistants: Cecilia Imthurn(Email: imthurnc@msu.edu), Andrea Wooley(Email: wooleya2@msu.edu)

Section 003: Stephanie Glaspie, Sofi Aultman, Ojas Fernandez, Courtney Easton, Aspen Tapley, Ian Stewart

Section 004: Joshua Dixon, Justin Skipper, Estelle Eichberger, Rosalia Miller, Maggie Broderick, Sorine Andronic, Wilhelm Hawes

Section 005: Sage Foster, Brody Stack, Alivia Johnson, Samuel Adjaklo, Nicole Majors, Carla Laza, Scarlett Purcell

Help Room Hours: Help room hours will be in-person only. There will also be discussion boards provided on Piazza for asking homework questions asynchronously.

- All in-person help room hours will be held in our classroom (2202STEM) on Mondays and in the carpeted area just outside our classroom on Wednesdays and Fridays. Hours are:
  - Mondays: noon-7:00 PM
  - Wednesdays 3:00-6:00 PM
  - Fridays 3:00-5:00 PM
- The schedule for all help room hours for the semester can be found at this link. This calendar will be maintained and updated in the case of last-minute changes or adjustments. Please check the calendar for the most up-to-date schedule.
  - Help room hours start Wed. 1/15.

    - Help room will not meet on: MLK Holiday (1/20), during Spring Break, or on Friday, 2/14
- All discussion boards can be found at: https://piazza.com + linked in general course information in D2L.
    - The Piazza discussion boards are a space to allow students to assist each other asynchronously in the course.
    - The discussion forum will be managed by course staff asynchronously Fridays through Mondays.

Course Links: D2L: http://d2l.msu.edu
Course Notes & Projects: http://msuperl.org/wikis/pcubed/
Coding: http://glowscript.org
Homework: https://LON-CAPA.msu.edu
Grading (exams, projects, weekly reflections/whiteboard uploads): http://gradescope.com
Piazza (asynchronous discussion forum): https://piazza.com/

Prerequisites:

- MTH 132(previously or concurrently) or MTH 152H or LB 118

This course is not open to students with credit in: LB273 or PHY 183B or PHY231 or PHY 231C or PHY 233B or PHY 193H.

There is no required textbook in this course. We provide lecture notes and short videos that line up with the content and work expected in class. If you would like to purchase a textbook as a supplement (completely optional), Matter and Interactions - 4th Edition by Chabay and Sherwood will most closely follow what we do in class. A calculator for our exams is required.

Course Description:

Projects and Practices in Physics (P^3) is an introductory calculus-based mechanics course that uses a problem-based learning approach. Rather than listening to lectures and answering clicker questions, during P^3 class meetings, you will work in groups to solve complex physics problems on whiteboards and to make models of these problems using a computer. Course instructors will not lecture, but will facilitate your learning by asking questions, prompting discussions, and, only when absolutely necessary, guiding your group. Pre-class readings and homework will introduce you to physics concepts.

In P^3, our aim is for you to develop a deep *conceptual understanding* of physics along with *problem-solving* and *computational modeling* skills that will serve you well in your future studies. Throughout P^3, you will learn that physics is about making simple models of systems and adding complexity to those models to make better predictions and provide richer explanations.

P^3 emphasizes four core ideas in mechanics:

1) Atomic interactions give rise to macroscopic phenomena
2) Forces cause changes in momentum; conservation of momentum
3) Changes in energy result from work done and heat exchanged; conservation of energy
4) Torques cause changes in angular momentum; conservation of angular momentum

Course Objectives:

- Develop a conceptual understanding of topics in mechanics
- Use models (qualitative, quantitative, and computational) to explain, predict, and describe physical phenomena
- Reflect on and improve scientific skills, such as group work, communication, planning, evaluating solutions, etc.

Course Activities

You should plan to attend class at your assigned time (depending on the section that you are enrolled in) each Tuesday and Thursday. Within the course, there are five major activities that will contribute to your grade. Below are short descriptions of each course activity.

1. **Pre-Class Reading:** For you to succeed in this course, you must be prepared to work on problems in your group. To that end, each week you are expected to read the course notes & watch short video lectures so that you come to class primed to work with relevant physics concepts for the problem at hand. We highly recommend that you take your own notes based on the readings.

2. **Class Meetings:** Rather than listening to lectures and answering clicker questions during class meetings, you and your group will work through complex physical problems and model the solutions to some of those problems using a computer. Occasionally, we will make use of VPython to model some problems – though no prior coding experience is necessary for this class. Course instructors will not lecture, but will facilitate your learning by asking questions, prompting discussions, and guiding your group when necessary. You will be working in groups to develop your understanding of the material needed for your exams, so you must attend your section of the course. **Do not attempt to attend other sections in lieu of the one in which you are officially enrolled**.

   Your in-class grade will be split into 2 parts:

   a. **Whiteboards & Reflections** – each week, you will be asked to complete a reflection about your in-class work & submit photos of your group's whiteboards. **Your reflection & whiteboards will be due on Fridays at 11:59 pm on Gradescope – late submissions will not be accepted for any reason**. The reflections will be used to help you set individual goals each week and to help you improve your scientific skills. The whiteboards will serve as documentation of your work each week, so you are able to refer back when studying for exams. (See the *Whiteboards and Reflection Rubric* on D2L for more details.)

   b. **In -Class Assessment** – Your reflection goals, along with your instructor's observations of your participation in class, will serve as your in-class assessment. Your grade will be based on 4 categories: your reflection, individual participation, group collaboration, & process skills. (See the *In-Class Assessment Rubric* on D2L for more details.) Your in-class grade will be sent out in an email each week prior to Tuesday's class.

3. **Weekly Homework:** You will be assigned weekly homework using LON-CAPA, which is a free homework system. Each homework set will consist of two parts: application problems & prep problems. The application problems will focus on the same topics covered in class the previous week. The application questions will consist of multiple-choice, numerical response, and graph-oriented questions. The prep problems will focus on key information from the readings for the next week of class. These problems will

help you prepare for class on Tuesday/Thursday. You should complete the readings for the week before doing the prep problems. **Weekly homework will be due on Mondays at 11:59 pm on LON-CAPA (except for set 1 which is due Wednesday, 1/15 at 11:59 pm).**

4. **Exams:** There will be two regular exams throughout the semester and a final exam at the end of the semester. Exams will be open-ended, free-response questions, not scantron graded. The regular exams will be given on Wednesday evenings from 7:30 – 8:45 pm (75 min) and will cover up to the content that you worked with in the previous week. Each exam, while not explicitly cumulative, will require that you demonstrate your understanding of prior material in some way. Exams will be closed note; however, you are allowed a calculator.

   Regular Exams Dates (7:30 – 8:45 pm) Sec. 3 and 4: 1310 STEM; Sec 5: 2202 STEM
   Wednesday, Feb. 19th and Wednesday, April 2nd
   Final Exam Date: Monday, April 28 8:00 pm –10:00 pm) Location: TBA
   Students must be available for these exams. If you have a conflict, please contact the instructor for your section as soon as possible. The make-up exam for class conflicts will be at 7:30AM on the Friday after our scheduled exam for exams 1 and 2; for the final/exam 3 the make-up exam will be at 10:00AM on the day after the exam.

   Each exam (Exam 1, Exam 2, and the final exam) will be worth 11% of your total grade in the course. Exam 1 will cover course material through HW 5(application). Exam 2 will cover material from HW 5(Prep) until HW 10(Application). The final exam will cover course material from HW 10(Prep) until the end of the semester. The regular final exam questions will not be cumulative; however, there will be two optional questions on the final exam that will be cumulative. See the section on accommodations & support structures for more info.

5. **Project Write-Ups:** Throughout the semester, there are also three in-class projects that you will complete with your group. These projects will be similar to the regular in-class problems, but you will be expected to turn in a written document of your solution, which will be graded by your instructors (See the *Project Rubric* for more details.) For the project write-ups, you will be expected to work with your group and turn in a single document for the group. The instructors will answer clarifying questions on these days, but will not guide your group toward a solution. Otherwise, you may use any resources you typically would for class (notes, homework, internet, etc.). *Note*: everyone in the group is expected to participate and contribute to the project write-ups. *If you miss more than 50% of the class periods prior to one of the project write-ups or if you arrive more than 30 min late to the project write-up, you will be required to do the write-up on your own.*

   Project Write-Up Dates (In Class): Feb 11th, Mar 20th, and Apr 22nd

   Students typically improve on the project write-ups over the semester, so the project scores will be weighted in your differently in the total grade for the semester. Your highest-scoring project will be worth 6% of your total grade, your second-best project score will be worth 5% of your grade, and your lowest-scoring project will be worth 4% of your grade.

Use of External Resources

The primary objective of this course is for you learn to "do physics": to develop an understanding of physical principles, and the ability to build models that apply those principles to solve unfamiliar problems. Practicing physicists make extensive use of discussions with colleagues and resources available on the internet to help them develop models and solve problems, and you are welcome to do the same with all class activities, except for exams. This includes discussing homework solutions with others in the class, consulting reference materials such as wikipedia, reviewing online lectures or example solutions to physics problems, or using generative AI tools such as ChatGPT.

You are responsible for making appropriate use of these resources to further your own learning. You are also responsible for ensuring that the work you turn in is a reflection of your own understanding. Simply watching others solve physics problems will not prepare you well for exams, so it is important to try hard to solve them on your own or in groups before consulting external resources. Similarly, turning in someone else's work as your own (be it from a peer or internet source) is still plagiarism. We would caution you that any resource you use should be critically evaluated. Many online sources have incorrect solutions. Additionally, generative AI tools are large *language* models, with no understanding of physics. As a test we provided past in-class projects to ChatGPT and scored its responses using our grading rubric. In the calculations category, it scored at most 2/12 points; overall, it always received a failing grade, typically around 30%.

The exception to this general policy is exams, where external resources are not permitted. While taking exams, you may only make use of a calculator and the reference materials provided with the exam paper. Discussion with classmates or use of personal notes or internet resources on exams is prohibited and will be treated as an instance of academic dishonesty under relevant MSU policies.

Grading Information

The course grade is determined by contributions from several sources: weekly homework, group work in class, whiteboard photos, exams, and project write-ups. Each of these contributes to the final grade in the following percentages:

Weekly Homework:	26%
In-Class Group Work:	18%
Whiteboard Photos(3%) & Reflection(5%):	8%
Exams:	33%
Project Write-Ups (Group-Based):	15%
Total:	100%

This course is not "graded on a curve" – the guaranteed scale below is based on the total percentage of points.

Course Score	Earned Grade
P > 92%	4.0
92% > P > 84%	3.5
84% > P > 76%	3.0
76% > P > 68%	2.5
68% > P > 60%	2.0
60% > P > 52%	1.5
52% > P > 44%	1.0
P < 44%	0

Grade Dissemination

Students will have access to their raw scores for each individual assignment through LON-CAPA for Homework. They will also have access to exams and project write-ups through Gradescope. In-class Group Work grades will be emailed to students on a weekly basis, along with group feedback from one of the teaching staff. Periodically, we will upload all of your scores to date to the gradebook in D2L for ease of reference in one location.

Course Communication

Announcements will be made at the start of class and will be posted on D2L. Students are responsible for staying up to date in the course, even if they miss a class period. We may make changes to this course as it goes along to address emergency situations (if needed), and we will follow university guidelines and requirements. To the best of our ability, we will provide this information through multiple channels (in class announcements, emails, D2L) and provide opportunities for questions about any changes that are made.

Please note that the faculty, graduate students, undergraduate students in this course have duties beyond this course. Allow 1 work day for written responses (e.g. email, discussion posts) – responses may be slower on weekends.

Absence Policy

Attending class is an important feature of this course as you will be working in groups and relying on each other. However, we understand that there may be things beyond your control that cause you to miss class. **Additionally, please do NOT attend in-person class if you are feeling ill.** If you miss a class, you should contact your group and your small group instructor to let them know you will be absent. Each week, you can earn up to 100 points for your In-Class Grade. If you miss one day of class, your score will be divided by 2 (maximum points for that week will be 50). If you miss both days, your In-Class Grade will be zero. **Your lowest in-class score will be dropped at the end of the semester. Similarly, your lowest two whiteboard/reflection scores will be dropped at the end of the semester.**

Additionally, you can make up four class periods of In-Class work no questions asked. You can do this by attempting the problem on your own, and then attending a help room hour to talk with one of the course staff within two weeks of the absence. Classes missed in the final two weeks of the semester must be made up by the Friday before finals week. Once the make-up is complete, points will be credited in D2L for the In-Class score and the Whiteboard part of the Whiteboard & Reflection. If one of two class days during a week is completed, the student should still write a reflection for full credit on the Reflection part of the Whiteboard & Reflection score. If both days are missed in a single week, then both days are eligible for make-up to include credit to D2L for the total Whiteboard & Reflection score for the week and the in-class score for the week (the student may make up one of the misses in such a week for 50% credit, or both for 100% credit). See the "How to make up a class period" document in the general course information/in-class rubrics & guidelines space in D2L for more details.

Together, these accommodations account for three weeks of missed class. **If you miss more than three weeks of class, you should contact the professor to make arrangements.** (If you miss classes due to religious observances, extraneous circumstances arise, etc., we will certainly allow more make-up class periods; however, you must contact your professor as soon as you are aware of the issue to receive this accommodation.)

We do *not* allow participation via zoom as a means to attend class. In this class format, a hybrid group with some people online and some in-person does not work. It is difficult to hear instructors, it is difficult to hear your group members, and see the whiteboard work, and the room environment is very loud. During the COVID pandemic, we taught a course in this format with two sections in person and two online for the first three weeks of the semester, and the average semester grade in the fully in-person sections was a full grade higher than in the sections that started in remote format. A remote participant in a hybrid group, with everyone else present in person, will be at an even greater disadvantage.

If you need to miss a part of class, this may be counted as an absence until you complete the problem in the help room per the regular make up policy. This would apply if you arrive late (such that you didn't get the beginning of the problem) or if you leave early (such that you didn't finish the problem). Even if you can only come to part of class, we would still encourage you to come to class. This will mean your make-up in the help room will go smoother and faster.

Accommodations and Support Structures

1. **Automatic drops -** We will automatically drop the following from your final grade in the course:

a. Your lowest in-class score
b. Your lowest two whiteboard/reflection scores
c. Your lowest homework score

2. **Exams** – On the final exam, there will be two optional questions. One question will cover the material covered in Exam 1. If your score on this optional question is higher than your lowest of the four questions on regular exam 1, this score will replace that single lowest score from exam 1. If your optional question 1 score is lower than your lowest scoring question from exam 1, then your exam 1 score will remain unchanged. The second optional question will cover material from Exam 2 and will follow a similar policy. **These questions will serve as a no-risk way to improve your exam scores** (you can only improve your scores, it won't decrease your grade).

3. **Help room** – Course staff will hold office hours/help room hours each week. There will be in-person help room hours and dedicated, asynchronous discussion board managers if you have any questions about homework, the material covered in class, the syllabus, or anything else about the course. You may attend at any time during the listed hours to ask questions about the homework, in-class problems, notes, etc. Course professors/instructors are also available by appointment to meet with you or your group; just send us an email.

4. **Accommodation Letters and Additional Accommodations** - Michigan State University is committed to providing equal opportunity for participation in all programs, services, and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for accommodation has been determined, you will be issued an individual accommodation letter. **Please present this letter to the professor at the start of the term and/or two weeks prior to the accommodation date (test, project, etc).** Requests received after this date will be honored whenever possible, but accommodation cannot be guaranteed.

5. **Extra Credit Opportunities** – There are three surveys offered this semester as extra credit. One is a group work survey which helps us pick your initial groups. The second and third are conceptual surveys that ask conceptual questions about topics in this course. The information from the conceptual surveys is used for research as well as to update the course semester-to-semester. If you complete all three surveys, we will add 1.5% (or 0.5% for each survey) to your final grade in the course. **Note: you will receive the credit simply for completing the surveys – the survey results will not be scored for correctness, that is your performance on them will have no impact on your grade in the class**. Your instructor will send you an email with a link to complete the group work survey before the start of the first week of class and will be due at 6PM on the first day of class. Links to the conceptual surveys will be sent to you in the second week of class, and near the end of the semester.

6. **Extraneous Circumstances** – We understand that there may be unforeseeable circumstances in this semester. These may include illness (yourself, a roommate, a family member, etc.), uncertainty in living arrangements, additional tasks (caretaking, moving, etc) or any number of things. If something occurs that interferes with your ability to work on this class, please contact the professor for your section (email, set up a meeting), and we will work with you to determine the best actions for this course. Please note, that you do not need to disclose any medical information or personal information, but please communicate with us about the supports you need for this class.

No Honors Option

There is no honors option for these sections this semester. Unfortunately, we do not have the time and availability among our graders to be able to handle the additional workload of an honors option. An honors course covering the same material is offered as PHY 193H in the fall semester of each year and should satisfy the same program and major requirements as PHY 183.

Learning and Course Continuity Statement:

If students are unable to attend class for an extended period of time (due to illness or extenuating circumstances), they should contact the instructor for their section to discuss needs and accommodations, which will be made on a case-by-case basis.

This course is taught by a team of instructors, including faculty, graduate teaching assistants, and undergraduate learning assistants. If one instructor is unable to attend class, the other teaching staff will cover the responsibilities or ask another instructor to fill in. Only in extreme circumstances (i.e. multiple instructors falling ill) would class be canceled. In such an event, this announcement and subsequent plans will be emailed to students and posted in D2L.

Emergency Protocols:

Everyone is expected to follow university guidelines regarding safety and procedures (including around COVID-19 and snow days/weather). At this time, masks are not required in classroom settings; however, you are certainly welcome to wear a mask if you wish. We ask that everyone is respectful of each individual's choice to wear a mask.

Campus Resources:

Below are a list of campus resources available to you as an MSU student:

- **COVID Policies** – If you are feeling ill or have tested positive for COVID-19, do not come to class. Reach out to medical professionals and follow university guidelines. Additional information on covid guidelines can be found at https://msu.edu/together-we-will/

- **Mental Health** - College students often experience issues that may interfere with academic success such as academic stress, sleep problems, juggling responsibilities, life events, relationship concerns, or feelings of anxiety, hopelessness, or depression. If you or a friend is struggling, we strongly encourage you to seek support. Helpful, effective resources are available on campus, and most are free of charge.
    - Drop by Counseling & Psychiatric Services (CAPS) main location (3rd floor of Olin Health Center) for a same day mental health screening.
    - Visit https://caps.msu.edu for online health assessments, hours, and additional CAPS services.
    - Call CAPS at 517-355-8270 any time, day or night.
    - 24-Hour MSU Sexual Assault Crisis Line 517-372-6666 or visit https://go.msu.edu/SAP

- **Food Insecurity** – The MSU Student Food Bank serves MSU students who are experiencing food insecurity by providing free food and related items. Food insecurity refers to having limited food availability with a reduction in the quality or variety of food intake, which often results in disrupted eating patterns. A lack of food security can be a considerable obstacle to academic success. Visit https://foodbank.msu.edu/ for more information.

- **Family/Parent Resources**: MSU has a resource center for students who are parents, including financial, academic, and parenting resources. Their link can be found here: https://studentparents.msu.edu/

- **MSU Writing Center** - You can read about the goals and mission of MSU's Writing Center here: https://writing.msu.edu/language-statement/ . To schedule an appointment at the writing center to review an outline and/or drafts, visit: https://msuwriting.mywconline.com/

- **MSU Library –** the MSU library has a variety of resources for accessing materials, including mailing books/resources to your house with pre-paid return envelopes. For more info on library resources, go here: https://lib.msu.edu/

University Policies

Spartan Code of Honor: As part of a new initiative the following statement of a "code of honor" regarding academic ethics has been included to make you aware of the ethics expected of you as an MSU student:

"As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do."

Any information in this syllabus is as accurate as is possible at the time of writing. Announcements about changes of any kind will be made in class, and posted on the web (D2L), and will *take precedence over this syllabus*. You are responsible for what is said in class, whether or not you are in attendance.