



SCIENCE EDUCATION 201

Matter and Energy in Physical Systems

Spring 2022

*This syllabus is subject to change. Changes, if any, will be announced in class.
Students will be held responsible for all changes.*

COVID Policies

Masks. Due to ongoing community spread of COVID-19, proper use of masks is required in all indoor spaces on campus, including our classroom. We are required to wear masks until April 11. After April 11, you may choose not to wear a mask.

Quarantine. My goal is to prioritize your health and the health of the students, staff, and faculty who work together at WWU. If you experience symptoms, receive a positive COVID-19 diagnosis, or are exposed to COVID, please stay at home.

Changes in modality. The United Faculty of Western Washington University (UFWW) has agreed with the WWU administration that faculty who teach in-person can request to change face-to-face instruction to remote instruction on a short-term basis. I intend to maintain in-person instruction, but I will change modality if I:

- experience an exposure event (including in the classroom),
- receive a positive COVID test via WWU's voluntary employee testing program, or
- develop other concerns due to case rates or other COVID indicators on campus or in our community.

If we need to change modality, I will alert you as soon as possible via Canvas and a direct email message. In that event, I will convene class via Zoom, and all activities and assignments will be submitted online.

INSTRUCTOR

Name: Dr. Thanh Lê (she/her)
You may call me *Thanh*, *Ten*, *Dr. Lê* ("Lay"), or *Prof. Lê*

Hours: MWF 12-1pm

Location: SMATE LRC

E-mail: let30@wwu.edu

TEACHING ASSISTANT

Name: Kel Mossman

Hours: TBA

Location:

E-mail: mossman@wwu.edu

COURSE INFORMATION

Website: wwu.instructure.com

Time: MWF 10-11:50am

Location: SL 240

Credits: 4

GUR: LSCI

TEXTBOOK

Title: *Next Gen Physical Science and Everyday Thinking (Next Gen PET)*

Authors: Goldberg, Robinson, & Otero

Modules:

- M Model for magnetism
- EM Energy-based model for interactions
- PEF Potential energy and fields
- FM Force-based model for interactions

COURSE DESCRIPTION

General description

SCED 201 is a student-centered, lab-based physics course intended primarily for students interested in a career in K-8 teaching but is open to all students.

The course is focused on the foundational concepts of energy and force. We will develop and apply an energy-based model and a force-based model for motion and interactions for real-world situations and phenomena.

There will be little traditional lecturing in this course. Instead, students work in small collaborative groups generate to knowledge through their own work and discussion. The instructor will serve as a facilitator rather than the source of knowledge and answers. Thus, learning is student directed and achieved through collaboration and consensus.

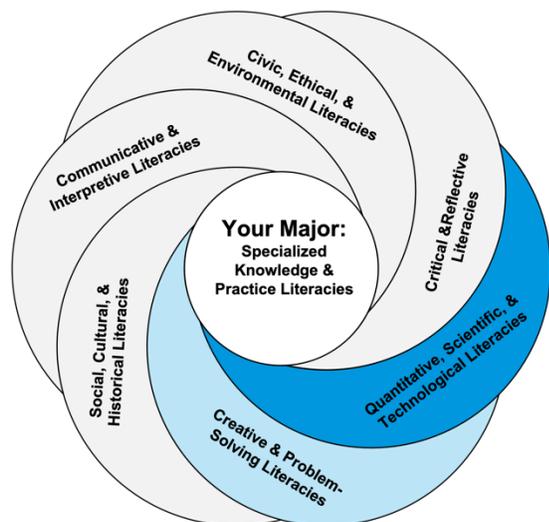
Learning outcomes

The course has two major learning outcomes:

1. **Physics content.** Students develop understanding of basic physics concepts of energy and force based on their own investigations. Students apply these concepts to explain real world phenomena.
2. **Learning about learning.** Students develop awareness of how their own ideas change and develop, and reflect on specific ways the curriculum and instruction facilitates these changes.

GUR LSCI

SCED 201 fulfils the LSCI GUR. The course contributes to your Core Knowledge Literacy focused on Quantitative, Scientific, & Technological Literacy and Core Practice Literacy focused on Creative & Problem-Solving literacy through building energy and force based models to describe and explain the underlying physics concepts and principles for a wide variety of physical phenomena and use the fundamental principles to predict the behavior of physical systems.



COURSE STRUCTURE

Course materials

The course materials - *NextGen PET* - are not a traditional textbook. Instead, they are more like a workbook, with sequences of questions and experiments. As you work through these, you will record your ideas, predictions, and observations. You will add more to this "lab notebook" during the full-class discussions - to describe how you are modifying or expanding your thinking based on the ideas of other students in the class.

The questions in the NextGen PET units, together with your written answers and explanations, form the "textbook" for the course and will be the primary written resource for your learning. A high-quality lab notebook will contain clear statements of the consensus scientific ideas the class has developed, as well as the steps that you personally took to come to an understanding of these ideas.

You will draw on your lab notebook when completing homework, studying for exam, and writing learning reflection papers.

Role of the instructors

The professor and TA will provide guidance and facilitate your work. Some specific roles include reflecting student ideas back to the class for further discussion, asking questions to draw out and clarify student ideas, summarizing ideas that have emerged in class discussion, and providing feedback on students' work. The instructors will provide feedback on student ideas and guide next steps in learning.

Time commitment per week

Course element	Time
Class time	5.5 h
Outside class time assignments*	3.5-5.5 h
TOTAL	9-11 h

* You should expect to work, on average, one hour outside of class for every hour of class time.

COURSE POLICIES

Attendance

Because of the collaborative nature of this class, it is important to attend all Zoom class meetings and arrive on time. Your learning depends on being present and participating. In addition, your partners are depending on you.

You can miss up to four (4) classes with no penalty. Each additional absence will drop your course grade a full letter grade. See the grading contract for more details.

There are many reasons why a student will miss a class, and you aren't obligated to provide me with an excuse for your absence. You may contact me if you feel it is necessary; for missed work, see Canvas which will be updated with class summaries and assignment deadlines.

Communication

I use Canvas announcements to communicate to the whole class and email to communicate with individual students. You are expected to check your WWU e-mail account and Canvas daily.

Expectation of respect

All of us are responsible for being respectful of everyone in this class, including during work group time when I am not present. I expect all students to make their best efforts to pronounce one another's names correctly, and to respect one another's personal pronouns. It is important that we listen and engage respectfully with each other to maintain an inclusive and supportive learning environment.

Labor-based grading contract for SCED 201

I will use a labor-based grading contract to calculate your final course grade. I use Asao Inoue's framework (*Labor-Based Grading Contracts*). This grading contract is based on Dimitri Dounas-Frazer's contract from his SCED 201 course.

What is a labor-based grading contract?

This document is our labor-based grading contract, and it outlines the basic guidelines of our contract.

This means if you do the labor asked in the spirit it is asked and submit all work in the manner it is asked, then you will receive a final grade of a B+ no matter what I think of your work or what your peers think of your work.

We will reexamine this document during week 5 of the quarter to make sure it fair to everyone.

Why use a labor-based grading contract?

I previously used a conventional grading scheme that focused on students' mastery of the physics concepts with some consideration of student labor (or effort). I noticed, as Inoue argues, that conventional grading schemes can discourage students from taking risks and learning through failure. In addition, they can orientate students towards outcomes rather than the learning processes, so that students tend to focus more on acquiring points than on their own learning. Any grading scheme has drawbacks, but I'm convinced by Inoue that labor-based grading – the amount of labor students are willing and able to do – is a fairer way to calculate final grades.

In SCED 201, my goal is to cultivate a learning environment that focuses on and rewards effort, process, and feedback. I will pay attention to your ideas as they are articulated during class discussions, written assignments, and conversations with me via email or during office hours. I commit to providing feedback on your scientific thought and practice, often in the form of guiding questions.

What counts as labor?

Your default grade in SCED 201 is a B (or 3.00 on a 4.00 scale). If you do all the labor that is expected of you, you will earn a B. These requirements include coming to class prepared to learn, participating fully during class, embracing the spirit of learning physics from and with your peers, and completing out-of-class assignments, take-home midterm exams, and a final exam. It will not matter what your peers and I think of your work; if you put in the labor, you are guaranteed a B for the course. If you miss class, turn in assignments late, or forget to do assignments, you will get a lower grade.

LABOR REQUIREMENTS

Attending our classes, participating fully, and completing all the outlined tasks on time and in the spirit of learning constitute the labor requirements for a B in SCED 201.

I am aware that actively engaging with other students may pose a barrier to accessible learning for some people, and I understand that there are barriers to obtaining official accommodations from the university.

I am willing to work with students on a one-on-one basis to amend this labor contract through a shared understanding of what types of participation, collaboration, and individual work are accessible and equitable for you.

Note: In my transition to a labor-based grading contract from my conventional grading scheme, I haven't added assignments to the course. Homework, quizzes, and exams are no longer graded with a numerical score. Rather you receive feedback with strengths and suggestions for improvements.

Surveys

Two surveys are administered at start and end of the quarter. They help evaluate the impacts of the course on the class as a whole. Each survey takes approximately 30 minutes to complete.

Participation

In this course, students generate physics knowledge and understanding through a process of collaborative discovery. Active engagement is thus essential, and includes asking questions, responding to the questions of other students, and offering your own ideas. Engagement is critical both during small group work, as well as in the full class summarizing discussions, which occur at the end of each activity.

Review assignments (~ 15 total)

After most activities, there will be a review assignment to reinforce ideas developed in the activities, provide practice applying the key ideas to new situations, and offer opportunities for feedback on your thinking.

Extension activities (12 total)

Extension activities are online multiple-choice that check understanding from class and introduce some new ideas. They will be assigned after we complete most activities, and they will be due at the start of the following class.

Two participation commentaries

You may write a 750-word essay reflecting on your engagement in SCED 201. The commentary should identify one aspect of your class participation that you think is going well and one aspect that could be improved. More details will be available on Canvas. You must write two (2) commentaries to perform enough extra labor to boost your grade. Participation commentaries will be due weeks 3 and 9.

Written reflections (7 total)

After five selected activities, you will complete a short reflection on Canvas about your classroom experiences. These take approximately 10-15 minutes per reflection.

Midterms (2 total)

There will be two midterms in weeks 4 and 7. Midterms will be assigned on a Friday and due the following Wednesday. You may refer to your notes and other materials from class as well as relevant resources online for midterms. After your midterm is returned, you will make revisions based on the feedback you received.

Collaborative final exam

During the scheduled final time you will work in small groups to complete the collaborative final exam.

IMPROVING YOUR GRADE

You may choose to improve your grade by performing extra labor. I describe several items below which may count as extra labor. Other extra labor opportunities may exist. Each item will boost your grade by a third of a letter grade: from B to B+, B+ to A-, or A- to A.

Four (4) extra discussions about physics

At any point after week 1, you may attend either the professor's office hours or the teaching assistant's office hours to discuss topics or assignments from class. You must come prepared with questions of your own, and you must review all relevant class materials beforehand. You must attend office hours at least four (4) times for 15 minutes in order to perform enough extra labor to boost your grade. At least three (2) discussions must be with me (Thanh). Discussions about course logistics or degree requirements do not count as discussions about physics.

Two learning commentaries

You may write a 750-word essay reflecting on your understanding of the magnetic model, energy- or force-based models of interactions. The commentary should use evidence from your homework, quizzes, and midterm to provide evidence for changes in your understanding over time. More details will be available on Canvas. You must write two (2) commentaries to perform enough extra labor to boost your grade. Learning commentaries will be due in weeks 5 and 10.

Three explanations of physical phenomena

On the two midterms and the final, you may provide a scientific explanation for a phenomenon of your choice. You must describe a phenomenon, pose a question, and describe your answer using diagrams, graphs, and written narratives. More details will be available on the exams. You must respond to the optional prompts on all three exams to perform enough extra labor to boost your grade.

Some other labor that benefits the class

Do you want to demonstrate your physics knowledge through art, music, or performance? Are you interested in economic, social, or political aspects of physics? Would you like to create a lesson plan for teaching children how to make and interpret graphs? If you have an idea, let me know. We will plan it together so that the amount of labor is appropriate.

GRADING SCALE

If you show up to class and complete your work on time, you are guaranteed a B in the class. There are many legitimate reasons why you might skip a class or miss a deadline. You can miss a small number of classes or deadlines and still receive a B grade. However, too many missed classes, late arrivals, or missed deadlines will result in a grade reduction.

- **Late assignments** are assignments that are submitted after the deadline.
- **Missed assignments** are assignments that are submitted 3 days after the due date. Missed work is a more serious mark against your contract because its absence negatively impacts you and your classmates for multiple class meetings.
- **Ignored assignments** are assignments for which I have no record of you doing the work or turning it in.

You may improve your grade by completing extra labor, as described on the previous page. If you are performing labor at the B level, extra labor will improve your grade as follows:

- 1 extra item = course grade of B+
- 2 extra items = course grade of A-
- 3 extra items = course grade of A

If you are working toward a baseline lower than a B due to missed classes or assignments, you may complete more than 3 extra items to continue to raise your grade.

Mulligan

A mulligan is an extra chance. If you are unable to meet some aspect of the labor contract, please come to me as soon as possible, hopefully before the contract is breached. I will consult with you to find a fair and equitable arrangement. You may use a mulligan only once in the quarter. Please keep in mind that the labor contract is a public and social agreement, and it is my job to ensure that whatever arrangements we make will not be unfair to the other students in the course.

Exemplary labor

At the end of the quarter, if you have not missed any classes or deadlines and have not used a mulligan, then you will earn an extra third of a letter grade (equal to one extra item) on your final grade. This rule is meant to reward students who engage in all the labor required for the course in the fullest spirit asked of them.

FINAL GRADE CALCULATIONS

Letter grade	Numerical equivalent	Missed classes	Late assignments	Missed assignments	Ignored assignments
B	3.00	0-4	0-4	0-2	0
B-	2.67	0-4	5	3	0
C+	2.33	5	6	4	0
C	2.00	5	7	5	0
C-	1.67	5	8	6	0
D+	1.33	5	9	7	1
D	1.00	6	10	8	1
D-	0.67	6	11	9	1
F/Z	0.00	7 or more	12 or more	10 or more	1 or more

TENTATIVE SCHEDULE

Week	Dates	Activity	Assignments (due on this day)
1	W Mar 30	UM A1 – Modeling & the mystery tube	
	F Apr 1	UM A2 – Exploring magnetic effects	
2	M Apr 4	UM A3 – Developing a model for magnetism	Precourse assessment (required)
	W Apr 6	UM A4 – A better model for magnetism	Extension #1 (required)
	F Apr 8	UM A5 – Explaining magnetic phenomena	Review assignment #1 (required)
3	M Apr 11	Review UM	Extension #2 (required)
	W Apr 13	EM A1 – Interactions and motion	Review assignment #2 (required)
	F Apr 15	EM A2 – Motion and energy	Extension #3 (required) Participation commentary #1 (extra labor)
4	M Apr 18	EM A3 – Slowing and stopping	Review assignment #2 (required) Extension #4 (required)
	W Apr 20	EM A4 – Warming and cooling	Exam #1 (required) Review assignment #3 (required) Extension #5 (required)
	F Apr 22	EM A5 – Keeping track of energy in electric circuit interactions	Review assignment #4 (required)
5	M Apr 25	EM A6 – More on keeping track of energy	Learning commentary #1 (extra labor)
	W Apr 27	EM A7 – Conservation of energy	Review assignment #5 (required)
	F Apr 29	Review EM	Review assignment #6 (required)
6	M May 2	PEF A1 – Elastic objects and energy	
	W May 4	PEF A2 – Comparing magnetic and static electric interactions	Review assignment #7 (required) Extension #6 (required)
	F May 4	PEF A3 – Magnetic and static electricity interactions	Extension #7 (required)
7	M May 9	PEF A4 – Gravitational interaction	Extension #8 (required)
	W May 11	Energy Theatre	Review assignment #8 (required)
	F May 13	Review PEF	
8	M May 16	FM A1 – Interactions and forces	Exam #2 (required)
	W May 18	FM A2 – Motion with continuous force	Extension #9 (required)
	F May 20	FM A3 – Pushes and slowing down	Review assignment #9 (required) Extension #10 (required)
9	M May 23	FM A4 – Forces and friction	Participation commentary #2 (extra labor)
	W May 25	FM A5 – Changing force strength and mass	Extension #11
	F May 27	FM A6 – Falling objects	Review assignment #10 Extension #12
10	M May 30	Memorial Day – No class	
	W June 1	Review	Learning commentary #2 (extra labor)
	F June 3	Review	Postcourse assesement (required)
Final Collaborative Exam: Thursday, June 9 10:30 - 12:30 PM			

STUDENT SERVICES

<https://www.wvu.edu/overview-student-services>

Counseling Center

Location: Old Main 540
Website: <https://counseling.wvu.edu>
Tel: 360-650-3164

Consultation & Sexual Assault Support

Location: Old Main 585B
Website: bit.ly/wvu-CASAS
Email: pws@wvu.edu
Tel: 360-650-3700

Dean of Students

Website: <https://wp.wvu.edu/students/>
Tel: 360-650-3450

The Disability Access Center

Location: Wilson Library 170
Website: <https://disability.wvu.edu>
Email: drsfrontdesk@wvu.edu
Tel: 360-650-3083

Ethnic Student Center

Location: Multicultural Center, VU 736
Website: <https://as.wvu.edu/esc/>
Tel: 360-650-7271

Health Center Campus Services

Location: 2001 Bill McDonald Pkwy
Website: <https://studenthealth.wvu.edu/>
Tel: 360-650-3400

LGBTQ+ Western

Location: Multicultural Center, VU 753
Website: <https://lgbtq.wvu.edu>
Email: L.K.Langley@wvu.edu
Tel: 360-650-7500

Tutoring Center

Location: Wilson Library 280
Email: tutoring.center@wvu.edu
Website: <http://www.wvu.edu/tutoring/>
Tel: 360-650-3855

University Police

Location: 2001 Bill McDonald Pkwy
Website: www.wvu.edu/ps/police/
Email: university.police@wvu.edu
Tel: 360-650-3555

UNIVERSITY POLICIES

Academic Integrity Policy

You are expected to be familiar with, and to abide by, Western's Academic Honesty Policy and Procedure, and Student Rights and Responsibilities Code. These are published in the Western catalog in Appendix C, University Academic Policies. Refer to Plagiarism Policies & Guidelines (libguides.wvu.edu/plagiarism).

Reasonable accommodation

Reasonable accommodation for persons with documented disabilities should be established through The Disability Access Center (DAC) for Students: 650-3083; drs@wvu.edu; <http://www.wvu.edu/depts/drs/>

Religious Accommodation

Western provides reasonable accommodation for students to take holidays for reasons of faith or conscience or for organized activities conducted under the auspices of a religious denomination, church, or religious organization. Students seeking such accommodation must provide written notice to their faculty within the first two weeks of the course, citing the specific dates for which they will be absent.

Title IX and Sex Discrimination

Title IX makes it clear that violence and harassment based on sex which includes sexual harassment, gender-based harassment, and sexual violence (sexual assault, domestic violence, dating violence, stalking) is prohibited. Under Title IX, rape and sexual assault are forms of illegal sex discrimination. Survivors of sexual violence have the right to file a discrimination complaint or seek advice and assistance from the Equal Opportunity Office (EOO) in Old Main 345 (360) 650-3307; University Police (360) 650-3911 (emergency) or 650-3555 (report); Bellingham Police, 911 (emergency) or (360) 778- 8800 (report).