



**PHYS 2426, 01E, 20269 UNIVERSITY PHYSICS II
ELECTRICITY AND MAGNETISM
COURSE SYLLABUS: SPRING 2026**

Updates will be posted on D2L; check there for the latest version

INSTRUCTOR INFORMATION

Instructor: Dr. William Newton, Professor

Office Location: STC 236

Class time: TR 12:00-2:50pm, STC 146

Office Hours: TR 3-4pm and W 9-11am

Learning assistant: August Doss

GAT: George Nabila

University Email Address: william.newton@etamu.edu

Preferred Form of Communication: email/chat in person before/during/after class, and during office hours. **When emailing, please put "PHYS 2426" in the header.** **Note:** I will exclusively use your ETAMU university email addresses for email communication.

Communication Response Time: 24 hours

Important announcements about the class (assignments, due dates, etc.) will be communicated both by email and via announcements on D2L. It is your responsibility to check both these platforms at least once every day.

COURSE INFORMATION

Materials – Textbooks, Readings, Supplementary Readings

Textbook(s) Required: [*Introductory Physics: Building Models to Describe our World*](#) – Ryan Martin, Emma Neary, Joshua Rinaldo, Olivia Woodman.

This is an Open Source Textbook (free!). It has been adapted for this

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course, and will be available on D2L, as will all other material required for the class.

Accounts on the following apps. If you haven't got accounts on them already, use your school email as the account email.

- Free account on www.overleaf.com
- A Google account. We will need to use Google Slides

University Catalogue Description:

Second semester of calculus based physics with topics in electricity and magnetism for science, mathematics, and engineering students.

Prerequisites: PHYS 2425 with a minimum grade of C, MATH 2413.

Additionally, MATH 192 or concurrent enrollment.

Course Description

In Physics 2425, you learned how to describe motion. In physics, there are two methods, or strategies, you can choose from to figure out the motion of any object:

- 1) Using the "equations of motion" – in this case, Newton's 2nd law of motion – to figure out how an object's motion changes ("accelerates") under the action of a push or a pull from some other object (a "force"). Once you figure out the acceleration, the kinematic equations are used to figure out the velocity and position of the object at a given point in time.
- 2) Using conservation laws: conservation of energy and conservation of momentum – writing down the total energy and/or momentum of a system at the start of some process, and the total energy and/or momentum at the end of the process – and equating the two. You can then solve that equation for the velocity and/or position of whatever object in the system you're interested in. The two types of energy you used were kinetic energy (energy of motion) and potential energy ("stored" energy).

You can solve the same problem using (1) or (2), and you will get the same answer – because they are just two different ways of describing the same way the world works. THIS IS ALL OF PHYSICS 2425.

Question is: where do "forces" come from? Where does "potential energy" come from? In nature there are 4 "fundamental" forces:

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- 1) Electromagnetism – in everyday life, we tend to perceive this as two separate forces:
 - a. Electric
 - b. Magnetic
- 2) Gravity
- 3) Strong Nuclear Force
- 4) Weak Nuclear Force

and each force is associated with a “potential energy”. In Physics 2426 we are going to look at two of the four fundamental forces: Electricity and Magnetism (which it turns out are two manifestations of the same force), and Gravity. Turns out those two forces explain all of chemistry, matter and life, so we’re getting a lot of bang for our buck.

As we shall see, the answer to “where forces come from” and “where potential energy comes from” is “Fields”! In other words, in nature, all pushes and pulls are ultimately caused by the existence of “fields”: we shall burrow down into nature’s inner workings and discover electric fields, magnetic fields and gravitational fields. ***These three fields are responsible for 99.9% of everything you will ever see happen in your entire life!***

If, as we go through how this class will work, you are wondering *why* the class is designed like this, skip to section 12 for more details.

Student Learning Outcomes: Content

1. Using source laws (fields/forces) Students will be able to calculate the field at a particular point in space and the force it causes on a test particle due to source masses, charges and currents that are (a) due to point particles and (b) due to extended charge distributions.
2. Using source laws (potential/potential energy) Students will be able to calculate the potential at a particular point in space and the potential energy of a test particle in that potential field, due to source charges and currents that are (a) due to point particles and (b) due to extended charge distributions.
3. Equations of motion (force) Students will be able to calculate the effect of the force from (1) on the trajectory of the test particle – it’s resulting position, velocity and acceleration at different points in time
4. Equations of motion (energy) Students will be able to calculate the trajectory of the test particle – it’s resulting position, velocity and

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acceleration at different points in time – by considering the kinetic energy and the potential energy of the test particle from (2) as a function of time.

5. Symmetry and abstraction: Students will be able to use principles of symmetry, Gauss' law, Ampere's law to calculate and visualize the global nature of fields.

6. Practical application: Students will be able to calculate properties and effects of simple circuits involving resistors, capacitors, and inductors.

7. Students will be able to place the elements 1-6 together in different ways to solve more complex problems.

Student Learning Outcomes: Content: Skills

1. Students will be able to draw clear diagrams illustrating any problem, with all relevant information relating to the problem and its solution displayed and labeled

2. Students will be able to use proportional reasoning to perform calculations where it is relevant.

3. Students will be able to monitor whether what they're doing is correct and assess answers to problems by performing unit checks.

4. Students will be able to give an informed guess as to the expected answer to a problem before solving it, and to assess whether the answer they get is correct, using arguments from real world experience, experience of the content of this course, and order of magnitude estimation.

5. Students will be able to make logical connections between concepts they learn in this class and display those connections in a variety of ways including concept maps and mapping solutions to problems onto those concept maps and placing course knowledge into categories such as physical laws, definitions, derivations, numerical values and skills.

6. Students will display knowledge of the force and energy approaches to solving problems, and display an intuitive understanding of their mathematical differences.

7. Students will be able to work in groups to solve problems and elevate fellow classmates' knowledge.

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8. Students will display essential problem-solving skills including vector addition, algebraic problem solving, graphing and using the correct significant figures.

9. Students will develop strategies to use AI to aid learning and understanding

COURSE REQUIREMENTS

The instructional methods and requirements in this class may be unfamiliar to some of you. I have tried to explain them as thoroughly as I can below without making the syllabus 100 pages long. Please do read through all of it – you are going to be responsible for knowing what’s going on.

I will give lots of opportunity for you to ask questions in the first class, and I’ll give some examples of the standards, how grading works, and how it all looks in D2L, but you’ll need to have read this first.

Minimal Technical Skills Needed

WRITING

By far the most important skillset is **clear communication, particularly in your writing**. Contrary to many people’s belief, **writing** is one of the most important skills in all of science. If you can’t tell me what you’re doing, why you’re doing it, and why I should believe your answer, than you cannot demonstrate understanding of the material. This is not just my personal preference – employers are going to require this. In fact, they are going to require it **more** as advanced AI becomes used more in the workplace. If you need help with writing skills, the writing center is an excellent resource: <https://www.etamu.edu/writing-center/>

And so a word about using AI to help you out in your writing skills:

AI cannot tell me why you decided to ask it to do what you did. And while you can input a question and get it to output a lot of stuff that is correct, often a lot of that stuff is not **relevant** or **necessary** to the question that was asked. It requires you telling it why you want to do what you’re asking it, and it requires you telling it what is relevant and necessary. That is where **your** understanding comes in. As explained below, I am grading based on evidence that you understand the material, and being unable to direct AI suitably will result in answers that do not contain such evidence.

MATH

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You need to be comfortable with basic algebra, vector addition, differentiation and integration.

PHYSICS

We are adding further layers to the scaffolding you built in Physics 2425. Everything in Physics 2425 will be required (and taken as known) – especially Newton's laws of motion, the kinematic equations, energy, work, the work-energy theorem, momentum, conservation of momentum and conservation of energy.

Instructional Methods

This course is taught in *studio* mode: class time is spent working collaboratively in groups on problems and tutorials, while lectures come in the form of videos which you need to watch outside of class. The reason is simple: my job is to help you learn physics. If I lecture all class, the only thing I have to go on is assignments you turn in. But if you struggle with the material, I have absolutely no way of knowing *why* – what are the things holding you back? Often, you will not have a good idea of how well you know something or what the gaps are in your skillset. If I knew those things, I could actually do my job – which is teaching you.

The only way to know how to help you is to see you in action solving problems. I can see what's going on, and help you in real time. All the things that I can do without interacting with you might as well be done outside of class.

Other than allow me to do my job of teaching, there is strong evidence that students learn more in introductory physics classes if they are conducted in studio mode rather than lecture mode. Ask me if you want to see it!

What I care about you learning

Your whole class grade will be based on demonstrating mastery of a set of standards. These are just a list of content or skills based tasks that, if you can do them, demonstrate you understand them. As you come to understand a particular topic, or become proficient at a particular skill, that standard gets checked off. If you check most of them off, you get an A!

As an example, this might be a content standard:

"I can solve problems involving calculating the field of a collection of point charges, and the force on a particular test charge"

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Once you have satisfactorily demonstrated you can do that – by solving a number of those problems – then you get the full credit for that standard.

Here's an example of a skills standard:

"I can consistently identify source and test charges and masses"

Again, demonstrate this skill enough times when you solve problems, and you get the standard!

All the standards are listed at the end of the syllabus, with explanations of the three types they break down into. **You are responsible for understanding the system, and how you gain points to obtain your grade. I will take you through how it appears in D2L in class.**

The following are the levels you can attain on each standard

0. I have not presented evidence yet that I understand the material
1. I have demonstrated some partial understanding of the material: I am on my way!
2. I have demonstrated procedural mastery of the learning target; I am getting close to expert mastery.
3. I have demonstrated expert mastery of the learning target

There are two types of mastery reflected in the levels above

Physics is a set of skills and processes that allow us to figure out how the natural world works. The things we uncover using physics are the content – in this course the content covers electricity, gravity and magnetism – but *doing* physics consists of applying skills to use the content we do know to figure out content we don't. Each problem you solve requires a set of skills and knowledge that I roughly break into two levels, which reflect the difference between mastery levels 2 and 3.

Procedural Mastery: This shows you can follow a set of steps to calculate and correctly report an answer to a question. The student should be able to demonstrate to the instructor that they:

- Can draw a big, clear and clearly labeled picture with all relevant information on it
- Can follow a procedure to obtain a symbolic answer to the problem, with all symbols clearly defined
- Can obtain an accurate numerical solution to the problem
- Can display the solution to the correct number of significant figures

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- Can convince the instructor that the units are correct

Expert mastery: This shows you have attained a deep understanding of the subject matter. In addition to procedural mastery, it requires demonstrating that you

- Can state the assumptions that have to be made in order to solve the problem
- Can convince the instructor that the answer you obtained is plausible
- Can trace the solution across the landscape of physics (we will discuss what this means in class extensively)

Student Responsibilities

I expect you to have read the syllabus!

You are expected to attend the majority of classes for the full time. Of course, there will be times you cannot attend for legitimate reasons. In that case, **let me know**. A requirement of being allowed to make up work is that you don't disappear for more than one class without letting me know what's going on. Once I know, I will make every effort to help you make up the material missed.

The majority of class time will be spent working in groups. You are expected to participate fully in group-work.

You are expected to have completed the reading and watched and taken notes on any lectures by the due dates.

You are expected to take notes on all problems you solve in class, and any notes shared by other groups on whiteboards. For work displayed on whiteboards, the easiest thing to do is to just take photos of the work using camera phones, but they will have to be organized later by taking the notes down from the photos, otherwise you will just end up with a lot of random photos of equations that may only be useful to send to your family to impress them.

You are expected to complete the tutorial worksheets; although the in-class tutorials are not graded, you will need complete worksheets to do the tutorial homework and to study for assessments

I expect you put in a good faith effort to actually understand the material. Although we'll be using AI, using it to just spit out the answer to a question

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is not a productive use of your time. Many assessments will be done in-class without use of AI.

GRADING

Grades are regularly updated in D2L. above for an explanation of Standards-based Grading

VERY IMPORTANT: With standards based grading, individual assignments are not graded. You are graded on how much mastery you have developed on each of the standards. You can accumulate up to 200 points over the semester. The grade is only based on points – not a percentage that they could be converted to. The standards are listed with more explanation at the end of the syllabus.

Grade	Total points accumulated
A	180-200 points
B	160-179.5 points
C	140-159.5 points
D	120-139.5 points
< D	Anything else

Classes missed

According to the grading scheme, you gain points for check in/out questions and class assessments. If you miss class, that's points you won't get. Sometimes missing classes is unavoidable, however. I allow **2 missed classes** per semester without penalty. Since there are only two classes/week, that's a week missed class time, and any more will seriously impact your ability to gain content and skills points. If you miss more, you will unavoidably miss those completion points. Note each Tuesday class, full attendance is worth 0.5 points and each Thursday class is worth 1.5 points.

Assessments

The purpose of assignments is to give you opportunities to demonstrate your understanding of the material. **You do not get a numerical grade that contributes to your class grade on each assignment.** They are to provide evidence of your progress through the various standards. Every assignment will list the standards that it assesses. I will look for evidence for

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your understanding in your answers to each assignment. If I see it, I will check off the appropriate level on the assignment on D2L. Multiple assignments will cover the same standards, so if you don't get it the first time you will have multiple opportunities to do so. This is how learning works! You practice multiple times, and you get better each time.

In order to get each level of a particular standard checked off, you have to demonstrate you have achieved it on more than one assignment.

For level 1: You have to demonstrate you have achieved it on 3 assignments

For level 2: You have to demonstrate you have achieved it on 2 assignments

For level 3: You have to demonstrate you have achieved it on 1 assignment

On certain assignments, you will receive feedback and be given one opportunity to make revisions and resubmit.

Here are the types of assignment:

Class check-in/out questions:

During the first and last 5 minutes of class you will be given a question with a very brief answer (sometimes multiple choice) which allows me to assess the class' understanding of a fundamental concept. They will be turned in immediately and the answer given after (or the beginning of next class). If you miss one of these you cannot take it (e.g. if you come into class 15 minutes late you cannot take it).

Weekly in-class assessments:

Most weeks, the last 30-40 minutes of the Thursday class will be spent working individually on a single problem covering the material we learned in the past week. This will be turned in at the end of class, and returned to you at the start of Thursday's class. This is one opportunity for you to demonstrate progress on standards.

Purpose: To assess preliminary of material in a way that you and I get immediate feedback on how your learning is progressing, allowing us to identify areas of difficulty quickly before they impact future work. Assess standards

Practice with AI:

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Every two weeks we will have an activity that explores how to use AI as a tool to further our understanding. These will make use of the typesetting mark-up language LaTeX. Don't worry if you don't know it: you won't be required to have any in-depth knowledge, and I will go through everything you need to know in class. We will use LaTeX via the LaTeX document preparation website Overleaf. You need to register for a free account, and I will email you access to the document you will be using.

The each AI activity will progress over two weeks. Here's how they unfold:

Tuesday: last 30-40 minutes, you work in groups on a problem and come up with a fully written solution, and turn it in.

Between Tuesday and Thursday: you ask an AI of your choice to solve it, output both the prompt and the answer in LaTeX and copy and paste the answer into Overleaf, and hit the compile button.

Thursday: First 30-45 minutes: Each group will be given a random group's solution from Tuesday, and a random AI solution I have taken from Overleaf. In your group, you will attempt to compare and grade each solution. This will involve discussing what aspects of the question you got right as a group, what AI got right, and how to combine both to learn more.

The Thursday a week later: You will individually turn in an analysis of what AI did right/what the group did right – and what AI seems to do well, and how to improve the answer, and present a correct solution.

This will extensively test several standards.

Purpose: To develop strategies to use AI as a tool for learning and assess standards.

Homeworks:

Homeworks will feature traditional textbook problems (written mostly by me!) and tutorial homeworks which assess conceptual understanding.

Purpose: assess standards.

In any and all work, you are free to use any physical or online resources at your disposal: BUT DO see the University AI policy later in this syllabus.

In any assignment it will be clearly stated whether or not use of AI is allowed, and if it is, what you must do to document its use.

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Course Outline/Calendar

This schedule is intended as a rough guide only, and WILL change.

Week	Topic
1: Jan 12-16	Assembling a physics toolkit: Physics I review, exploring the physics landscape
2: Jan 19-23	Matter, charge and mass
3: Jan 26-30	The Force Landscape: Coulomb's law and Newton's law
4: Feb 2-6	The Force Landscape: Adding forces/vector addition
5: Feb 9-13	The Energy Landscape: Potential Energy
6: Feb 16-20	The Energy Landscape: Potential Energy
7: Feb 23-27	The Force Landscape: The Biot-Savart law
8: Mar 2-6	The Force Landscape: Force Fields
SPRING BREAK MAR 9-13	
9: Mar 16-20	The Energy Landscape: Potential Fields
10: Mar 23-27	The Energy Landscape: Potential Fields
11: Mar 30-Apr 3	Extended charge and mass distributions
12: Apr 6-Apr 10	Flux, Gauss' and Ampere's law
13: Apr 13-Apr 17	Flux, Gauss' and Ampere's law
14: Apr 20-Apr 24	Circuits
15: Apr 27-May 1	Circuits

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

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ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@etamu.edu

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a ETAMU campus open computer lab, etc.

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your instructor.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

Interaction with Instructor Statement

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning

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environment. The Code of Student Conduct is described in detail in the Student Guidebook.

<https://inside.etamu.edu/admissions/onestopshop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum:

<https://www.britannica.com/topic/netiquette>

ETAMU Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedures 13.99.99.R0.01](#)

<https://inside.etamu.edu/admissions/registrar/generalInformation/attendance.aspx>

Academic Integrity

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

<https://inside.etamu.edu/aboutus/policiesproceduresstandardsstatements/rulesprocedures/13students/graduate/13.99.99.R0.10.pdf>

<https://inside.etamu.edu/academics/graduateSchool/faculty/GraduateStudentAcademicDishonestyForm.pdf>

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

East Texas A&M University

Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@etamu.edu

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Website: [Student Disability Services](#)

<https://www.etamu.edu/student-disability-services/>

Nondiscrimination Notice

East Texas A&M University will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and ETAMU Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#)

document and/or consult your event organizer.

Web url:

<http://www.etamu.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all ETAMU campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

East Texas A&M University Supports Students' Mental Health

The Counseling Center at ETAMU, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.etamu.edu/counsel

Mental Health and Well-Being

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The university aims to provide students with essential knowledge and tools to understand and support mental health. As part of our commitment to your well-being, we offer access to Telus Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available to you for guidance and support whenever you need it.



<http://telusproduction.com/app/5108.html>

AI use policy [Draft 2, May 25, 2023]

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism). Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty

13.99.99.R0.10 Graduate Student Academic Dishonesty

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STANDARDS

The total number of points you can get in this class is 200, and that will determine your class grade. You all start on zero, naturally. But you can only go up from there! In D2L, you will constantly be able to see the number of points you have, and therefore assess your own progress. Because all the standards are explicit, you will know exactly where you need to improve.

There are three types of standards, reflecting the things I want you to be learning and doing in this course. They types of standards are:

Content standards: these are the pieces of physics content I want you to understand well. They are broken down into 9 sections labeled C1, C2 etc. as laid out below:

1 Sources: Charge and Mass (9)

- 3 C1 I can consistently identify source and test charges and masses
- 3 C1 I can relate the charges and masses of the microscopic particles to everyday charges and masses
- 3 C1 I can use Coulomb's and Newton's laws calculate electrostatic and gravitational forces

2. Forces caused and felt by point charges and masses (12)

- 3 C2 I can add together electrostatic and gravitational forces in one dimension
- 3 C2 I can add together electrostatic and gravitational forces in two dimensions
- 3 C2 I can solve for the mass or charge of an object or their separation
- 3 C2 I can solve for the linear or circular motion of a test charge

3. The potential and kinetic energy point charges and masses (12)

- 3 C3 I can identify what is meant by the system and everything outside the system
- 3 C3 I can calculate the potential energy of a collection of point sources and a test charge in them
- 3 C3 I can calculate the work done on or by a collection of sources moving a test particle
- 3 C3 I can solve for the properties of a test particle using conservation of energy

4. Magnetic Electric and Gravitational Fields (15)

- 3 C4 I can calculate the direction and magnitude of the field due to charges of masses
- 3 C4 I can calculate the magnitude and direction of the magnetic field of sources using the Biot-Savart law
- 3 C4 I can calculate and show in math or as a diagram the force on a test particle from a field
- 3 C4 I can calculate and show the force on a test particle from combination of fields
- 3 C4 I can calculate a particles motion in one or more electric magnetic or gravitational fields

5. Electric and Gravitational Potential Fields (15)

- 3 C5 I can calculate the electric or gravitational potential a pouint in space for point sources
- 3 C5 I can represent lines of force and equipotential surfaces and relate the two graphically
- 3 C5 I can solve for the properties of one or more sources or tests given potential or potential energy
- 3 C5 I can calculate the potential energy of a test particle in a potential field
- 3 C5 I can determine the field at a point in space from the potential field around that point

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6. Fields of charge mass and current distributions (12)

- 3 C6 I can calculate linear surface or volume charge or mass densities
- 3 C6 I can derive the the field due to a continuous charge mass or current distribution
- 3 C6 I can calculate the field due to one or more continuous charge and current distributions
- 3 C6 I can calculate the properties of a test particle in fields of one of more charge/current distributions

7. Flux and the laws of Gauss and Ampere (9)

- 3 C7 I can use the work-energy theorem to derive the potential of a continuous charge and mass distribution
- 3 C7 I can calculate the potential of a number of continuous charge and mass distributions
- 3 C7 I can calculate the properties of a source of test in a source distributions using conservation of energy

8. Potential of mass and charge distributions (9)

- 3 C8 I can calculate the electric or gravitational or magnetic flux through an area
- 3 C8 I can use Gauss' law to find the field of a continuous charge or mass distribution
- 3 C8 I can use Ampere's law to find the magnetic field of a continuous current

9. Capacitors Resistors and Circuits (18)

- 3 C9 I can calculate the capacitance of a number of capacitors in series and parallel
- 3 C9 I can calculate the resistance of a number of resistors in series and parallel
- 3 C9 I can calculate or solve for the charge or potential difference across a network of capacitors
- 3 C9 I can calculate or solve for the current and potential difference across a network of resistors
- 3 C9 I can calculate the total energy stored in a capacitor and the total power dissipated by a resistor
- 3 C9 I can solve for the current through a multiply-branched circuit using Kirchoff's loop and junction laws

As outlined in the main body of the syllabus, you can gain up to 3 points for each standard. All you have to do is demonstrate you can do the thing the standard describes on a specified number of questions (specified in the main body of the syllabus). Out of the

There are 111 points available for content standards.

The syllabus/schedule are subject to change.

Skills standards:

There are five sets of skills I want you to develop. You need to demonstrate that you have developed them three times over: in answering questions that cover content areas C1-C3, C4-C6, C7-C9. There are thus 45 points available for skills.

Completion standards:

The starting point for any understanding is practice – actually doing the work, and doing it **completely** – that is, giving it your best, most complete attempt on every single question. If you do so, you will gain completion points whether or not you get the question correct or demonstrate any standards. As listed below, 44 points are up for grabs in completion points.

Learning Skills Weeks C1-C3

- 3 SK1 I can set up a problem using diagrams and assumptions
- 3 SK2 I can solve a problem algebraically and numerically
- 3 SK3 I can evaluate a problem using estimates and unit checks
- 3 SK4 I can give the big picture of the problem
- 3 SK5 I can analyze the best way to utilize AI to solve the problem

Learning Skills Weeks C4-C6

- 3 SK1 I can set up a problem using diagrams and assumptions
- 3 SK2 I can solve a problem algebraically and numerically
- 3 SK3 I can evaluate a problem using estimates and unit checks
- 3 SK4 I can give the big picture of the problem
- 3 SK5 I can analyze the best way to utilize AI to solve the problem

Learning Skills C7-C9

- 3 SK1 I can set up a problem using diagrams and assumptions
- 3 SK2 I can solve a problem algebraically and numerically
- 3 SK3 I can evaluate a problem using estimates and unit checks
- 3 SK4 I can give the big picture of the problem
- 3 SK5 I can analyze the best way to utilize AI to solve the problem

Completion

- 15 Completion Check in/out (0.5 points/class)
- 15 Completion Homework (1 point per homework)
- 14 Completion AI (2 points per assignment: 1 for the Overleaf part, 1 for the comparison with group answers)

The breakdown of points reflects what I think the relative importance is of each type of standard. Just over 50% of the points goes to content, just under 25% goes to skills and just under 25% goes to completion. Note that completing everything already gets you well on your way towards the 200 points.

The syllabus/schedule are subject to change.

Weekly schedule

The class will follow roughly the same schedule on a two-week cycle. The first four weeks are listed below. After that, the schedule for weeks 3 and 4 repeat for the rest of the semester. Of course, sometimes events will necessitate changes to this, but for the most part we will stick to this

Week 1		Week 2	
MON	Week 1-2 Material on D2L Week 1 HW on D2L Week 2 HW on D2L		
TUE	12:00-12:05 Check-in 12:05-12:30 intro presentation 12:30-1:00 intro presentation 1:00-1:30 intro group activity 1:30-1:50 BREAK 1:50-2:20 intro group activity 2:20-2:45 AI Prep Group Question 2:45-2:50 Check-out	TUE	12:00-12:05 Check-in/Turn in HW1 12:05-12:30 12:30-1:00 1:00-1:30 1:30-1:50 BREAK 1:50-2:20 2:20-2:45 2:45-2:50 Check-out
THU	Deadline to post AI answer in Overleaf 9:30 12:00-12:05 Check-in/ 12:05-12:30 AI group evaluations 12:30-1:00 force picture 1:00-1:30 force picture 1:30-1:50 BREAK group 1:50-2:20 work 2:20-2:45 Weekly assessment 2:45-2:50 (above includes check-out)	THU	Deadline to post AI answer in Overleaf 9:30 12:00-12:05 Check-in/Turn in AI analysis 12:05-12:30 12:30-1:00 1:00-1:30 1:30-1:50 BREAK 1:50-2:20 2:20-2:45 Weekly assessment (above includes check-out) 2:45-2:50

The syllabus/schedule are subject to change.

Week 3		Week 4	
MON	Week 3-4 Material on D2L Week 3 HW on D2L Week 4 HW on D2L		
TUE		TUE	
12:00-12:05	Check-in/Turn in HW2	12:00-12:05	Check-in/Turn in HW3
12:05-12:30		12:05-12:30	
12:30-1:00		12:30-1:00	
1:00-1:30		1:00-1:30	
1:30-1:50	BREAK	1:30-1:50	BREAK
1:50-2:20		1:50-2:20	
2:20-2:45	AI Prep Group Question	2:20-2:45	
2:45-2:50	Check-out	2:45-2:50	Check-out
THU		THU	
9:30	Deadline to post AI answer in Overleaf	9:30	Deadline to post AI answer in Overleaf
12:00-12:05	Check-in/	12:00-12:05	Check-in/Turn in AI analysis
12:05-12:30	AI group evaluations	12:05-12:30	
12:30-1:00		12:30-1:00	
1:00-1:30		1:00-1:30	
1:30-1:50	BREAK	1:30-1:50	BREAK
1:50-2:20		1:50-2:20	
2:20-2:45	Weekly assessment	2:20-2:45	Weekly assessment
2:45-2:50	(above includes check-out)	2:45-2:50	(above includes check-out)

The syllabus/schedule are subject to change.