Physics 425
Quantum Physics
Spring, 2024

Meets:
10:00 am – 11:50 am
Tuesday, Thursday
150 Meldrum Hal

Instructor:
Dr. Christopher Cline
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832-2346
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Textbook:
Required: *Introduction to Quantum Mechanics*, 3rd Ed., David J. Griffiths & Darrell Schroeter.

Course Description: Physics 425 is a junior/senior level course in quantum mechanics – the study of the behavior of the smallest components of our universe, such as fundamental “particles”, atoms, and molecules. Quantum mechanics is a collection of postulates and consequences thereof, formulated in the language of mathematics, which provides tools for the analysis, prediction, and understanding of observed phenomena in the microscopic domain. As such, this is a course in purely theoretical physics, and so will involve a heavy dose of mathematics, including multi-variable calculus, differential equations, and linear algebra. I will show you how to use these mathematical techniques to solve the physics problems, rather than assuming that you remember them from somewhere else. This course will begin to look a lot like an advanced mathematical methods class; however, remember that the mathematics is only a tool; don’t let it get in the way of the physics.

Many students find quantum physics to be difficult for a number of reasons, not least because it appears to counter so much of the rigor of classical physics that students have worked hard to learn in their early courses in high school and college. Its "essence" appears completely at odds with one's experience and sense of how things "ought" to work. The apparent "counter-intuitiveness" of quantum mechanics has the consequence that it is virtually impossible to develop the subject with the smoothness with which one can Newtonian mechanics, and so many students have said that they just don't "get" quantum mechanics. To a large extent the only real option is to plunge in to the guts of quantum mechanics and trust that the customs of quantum culture will become familiar as one's experience with it grows. Our key goal in this class is to give you the mathematical tools, and the practice, to *do* quantum mechanics. The logic here is that understanding begins with familiarity. Much private study, calculation, and reflection are necessary to develop a proper sense of how quantum mechanics "hangs together" - there is no one formula or group of magic words to help you "get it" quickly. Mull things over in your own mind, discuss them with your classmates and me, and when you come to understand something, write it down.

Some of you have had an introduction to quantum mechanics in your first course of physical chemistry. Although I think review is a good idea, I do not want to spend all our time treading old ground. So, following a spiral metaphor – where we revisit old material, but with more depth – we will plumb the depths of some of the material you have already covered, but we will push on into new territory too.

My goal is to have minimal lecturing and lots of discussion from your readings. We will also explore the ideas of quantum physics through ConcepTests and Tutorials. Also, I hope to have lots of problem solving. I’ll do some in class; you’ll do lots in class; you’ll do lots more at home.

As you grapple with the concepts of quantum physics, and attempt to make sense of everything, it might help to revisit Richard Feynman’s observation:

> “Now we know how the electrons and light behave. But what can I call it? If I say they behave like particles I give the wrong impression; also if I say they behave like waves. They behave in their own inimitable way, which technically could be called a quantum mechanical way. They behave in a way that is like nothing that you have ever seen before. Your experience with things that you have seen before is incomplete. The behavior of things on a very tiny scale is simply different. An atom does not behave like a weight hanging on a spring and oscillating. Nor does it behave like a miniature representation of the solar system with little planets going around in orbits. Nor does it appear to be somewhat like a cloud or fog of some sort surrounding the nucleus. It behaves like nothing you have ever seen before.” (*The Character of Physical Law*, MIT Press, 1965)

Learning Goals: Most of this class focuses on problems in one dimension, although the class also covers problems such as the hydrogen atom, angular momentum, and spin. This list represents what we want you to be able to *do* at the end of the course:

Course Scale Learning Goals

- **Math/physics connection:** Students should be able to translate a physical description of a junior-level quantum mechanics problem into the mathematical equation necessary to solve it. Students should be able to explain the physical meaning of the formal and/or mathematical formulation of and/or solution to a junior-level quantum mechanics problem. Students should be able to achieve physical insight through the mathematics of a problem.
- **Visualization:** Students should be able to sketch the physical parameters of a problem (e.g., wave function, potential, probability distribution), as appropriate for a particular problem. When presented with a graph of a wave function or probability density, students should be able to derive appropriate physical parameters of a system.
- **Knowledge Organization:** Students should be able to articulate the big ideas from each content area, and/or lecture, thus indicating that they have organized their content knowledge. They should be able to filter this knowledge to access the information that they need to apply to a particular physical problem. This organizational process should build on knowledge gained in earlier physics classes.
- **Communication:** Students should be able to justify and explain their thinking and/or approach to a problem or physical situation, in either written or oral form.
- **Problem-solving techniques:** When faced with a quantum mechanics problem, students should be able to choose and apply appropriate problem solving techniques. They should be able to transfer the techniques learned in class and through homework to novel contexts (*i.e.*, to solve problems which do not map directly to those in the book). They should be able to justify their selected approach (see \Communication" above). In addition to building on techniques learned in previous courses (*e.g.*, recognizing boundary conditions, setting up and solving differential equations, separation of variables, power-series solutions, operator methods), students are expected to develop specific new techniques as listed in concept-scale learning goals below.
    - **Approximations:** Students should be able to recognize when approximations are useful, and to use them effectively (*e.g.*, when the energy is very high, or barrier width very wide). Students should be able to indicate how many terms of a series solution must be retained to obtain a solution of a given order.
    - **Symmetries:** Students should be able to recognize symmetries and be able to take advantage of them in order to choose the appropriate method for solving a problem (*e.g.*, when parity allows you to eliminate certain solutions).
- **Problem-solving strategies:** Students should be able to draw upon their knowledge and skills to attack a problem even when a process leading to a correct solution is not yet clear. Students should continue to develop their ability to monitor their progress towards a solution by learning how to:
    - Backtrack and try a new approach when necessary
    - Recognize when a solution has been reached and be able to articulate why this solution is valid (see “Expecting and Checking Solution” below)
    - Persist through to the solution of problems requiring many steps
- **Expecting and checking solution:** When appropriate for a given problem, students should be able to articulate their expectations for the solution to a problem, such as:
    - The general shape of the wave function
    - Dependence on coordinate choice
    - Behavior at large distances
    - Problem symmetry

  For all problems, students should be able to justify the reasonableness of a solution they have reached, by using methods such as:
    - Checking solution symmetry
    - Verifying boundary conditions
    - Order of magnitude estimates
    - Dimensional analysis
    - Limiting or special cases (*e.g.*, checking the solution for correct behavior in limiting or known cases)

- **Intellectual maturity:** Students should accept full responsibility for their own learning. They should be aware of what they do and do not understand about physical phenomena and classes of problem. They should learn to ask sophisticated, specific questions. Students should learn to identify and articulate where in a problem they experienced difficulty and to take appropriate action to move beyond that difficulty. Finally, they should regularly check their understanding against these learning goals and seek out appropriate help to fill in any gaps.
- **Coherent Theory:** Students should recognize that the material covered in this course sets a framework for a consistent and complete understanding of quantum mechanics.
- **Build on Earlier Material:** While the material in the course represents a significant departure from earlier course work both mathematically and conceptually, students should recognize and make use of connections to prior work, techniques and understanding gained in classes in classical physics as well as in their modern physics class.

Subject Scale Learning Goals

The goals below pertain to specific areas in the study of quantum mechanics that are to be learned in this course. They are organized by subject and thus do not follow any textbook. The subject categories are:

- Mathematics
- Measurement and the quantum state
- The Schrödinger Equation
- Formalism
- Important Systems
- Scattering
- Angular Momentum and Spin

Mathematics

Prerequisites

- **Differential Equations**:
  - solve straightforward first and second order differential equations using a variety of methods.
  - recognize when separation of variables will simplify a differential equation and correctly apply the technique.
- **Complex Numbers**: Students should be thoroughly familiar with complex numbers and be able to find the real part, the imaginary part, the complex conjugate and the norm of any complex expression.
- **Linear Algebra**: Given a matrix operator, students should be able to find the eigenvalues and eigenvectors of the operator. Not only be able to diagonalize the matrix but be able to explain the physical significance of the procedure and the result.
- **Hamiltonian Formalism**: Students should be able to set up the Hamiltonian for a classical system.

Goals

- **Statistics**: Due to the statistical nature of quantum mechanics, students should be adept at computing probabilities and standard deviations.
- **Dirac Delta Function**: Students should be able to correctly compute integrals that contain one or more Dirac delta functions.
- **Vector Spaces**:
  - Given a set of real or abstract (e.g., Hilbert space) vectors, students should be able to determine whether the set constitutes a vector space.
  - Given a set of real or abstract (e.g., Hilbert space) vectors, students should be able to determine whether or not they form a basis of a given vector space.
- **Hilbert Space**: Students should be able to compute the correct coefficients of a Hilbert space vector given a basis.
- **Operator Theory**: Students should be able to compute the expectation value of an operator in a given state. More generally, compute all the matrix elements of an operator in a given basis. Identify a Hermitian operator.

Measurement and the Quantum State

Goals

- **The State Vector**:
  - Students should be able to correctly normalize a (normalizable) quantum state.
  - Students should be able to describe and calculate different representations of a quantum state (e.g., position space, momentum space).

- **Observable Operators**:
  - Students will know that observable quantities are represented by Hermitian operators.
  - Given a wave function and an observable operator, students should be able to calculate that operator's expectation value.
  - For simple systems (*e.g.*, 1-D infinite square well), students should be able to find the eigenvectors and eigenvalues for the energy operator.
- **Measurement Predictions**:
  - Given the eigenstates of an operator, students should be able to compute the possible results of a measurement of the observable which corresponds to that operator.
  - Given a quantum state and the eigenbasis of an observable operator, students should be able to compute the probabilities of obtaining the possible values which would result from a measurement of the corresponding observable quantity.
  - Given the results of a repeated measurement of an observable on a quantum state, students should be able to construct a plausible quantum state as a superposition of the eigenstates of the operator associated with the observable.
- **Measurement Effects**:
  - Students should be able to describe what is known about the state of a system immediately after a measurement, including the significance of the measured value.
- **Time Evolution**:
  - Given an initial wave function and a basis of energy eigenstates, students should be able to find the time-dependent wave function.
  - Given an initial wave function and a basis of energy eigenstates, students should be able to deduce when the probability distribution of an operator will be time dependent.
- **Operator Commutation and Compatibility**:
  - Students should be able to describe the relationship that must exist between two operators in order for a common eigenbasis to exist.
  - Students should be able to compute the commutator of the position and momentum operators as well as the commutation relationships between angular momentum operators.
  - Students should be able to describe the effect of following the measurement of an observable with the measurement of an incompatible operator.
  - Given two non-commuting observables, A and B and the result of a measurement of A, students should be able to compute the possible outcomes of a subsequent measurement of B along with the appropriate probabilities.

Schrödinger Equation

Goals

- **Time Dependent Schrödinger Equation**: Student should be able to use the time dependent Schrödinger Equation to compute the time evolution of a wave function.
- **Time Independent Schrödinger Equation**: Students should be able to describe the conditions under which separation of variables can be used to create a time independent Schrödinger Equation and use this equation to:
  - Students should be able to solve for the energy levels of the system
  - Students should be able to apply boundary conditions and solve for the stationary states (energy eigenstates) of the system
  - Students should be able to apply the Hamiltonian and boundary conditions to determine whether the energy eigenstates are discrete or continuous.
  - Students should be able to specify the evolution in time of a system when both an initial state and the energy eigenstates known

Formalism

Goals

- **Normalization**:
  - Students should be able to explain the relationship between the normalization of a wave function and the ability to correctly calculate expectation values or probability densities.
  - Students should be able to correctly normalize any wave function that represents a physically realizable state.
- **Hamiltonian**:
  - Students should be able to set up the Hamiltonian for a quantum mechanical system when they can calculate the potential energy for the corresponding classical system.

- Students should be able to use commutation relations to be able to determine which operators have eigenstates that are time independent.

- **Uncertainty Principle**:
  - Given a quantum state and an observable, students should be able to compute the uncertainty (standard deviation in the measurement) of the observable.
  - Given two observables, students should be able to compute the minimum uncertainty of measuring both observables on any quantum state.
- **Probability in Quantum Mechanics**:
  - Given a (time-dependent) wave function, students should be able to compute the time-dependent probability density.
  - For a given quantum state, students should be able to compute the probability of measuring any particular value for any common observable.

Important Systems

Goals

- **Infinite Square Well**: Students should be thoroughly familiar with all aspects of the one dimensional infinite square well.
  - Given the size and position of the potential, students should be able to compute the energy eigenvalues and the energy eigenstate position-space wave functions.
  - Students should be able to compute the time evolution of a superposition of energy eigenstates as well as the expectation value of common observables for a superposition state.
- **General One-dimensional Systems**:
  - Given a one-dimensional potential, students should be able to sketch the first few energy eigenstates.
- **Finite Square Well**: Students should be able to sketch the wave function for a system with one or more finite square wells. They should be able to qualitatively predict the time evolution of the wave function given an initial state.
- **Harmonic Oscillator**:
  - Given a specific harmonic-oscillator potential, students should be able to compute the energy eigenvalues.
  - Given the raising and lowering operators, students should be able to find the lowest energy eigenstate.
  - Given the raising and lowering operators and an energy-eigenstate wave function, students should be able to find the energy eigenstates on either side.
  - Students should be able to sketch the first few energy eigenstates of the harmonic oscillator.
  - Students should be able to compute position and momentum expectation values using the raising and lowering operators.
- **Free Particle**: Students should be adept at using the position-space and momentum-space wave functions of the free particle. In particular, use them to construct wave packets.
- **Hydrogen Atom**:
  - Students should be able to set up the Schrödinger equation for a hydrogen-like atoms.
  - Students should be able to perform variable separation on the Schrödinger equation for a hydrogen-like atoms.
  - Students should be able to describe the energy eigenstates for hydrogen-like atoms including the significance and use of their quantum numbers.
- **Two-State Systems**:
  - Given a two-dimensional Hamiltonian, students should be able to find its eigenstates and eigenvalues.
  - Given a two-state system in a superposition state, students should be able to correctly compute the probabilities of measuring each eigenvalue.

Angular Momentum and Spin

Goals

- **Angular Momentum in Quantum Mechanics**:
  - Students should be able to compute the angular momentum of a system in a known eigenstate of an angular momentum operator (*e.g.*, L^2, L_z)
  - Given a system in a known state, students should be able to compute the probabilities of the possible results of measuring an angular momentum observable (*e.g.*, L^2, L_z, L_y)
- **Spin**:
  - Given a system in a known state, students should be able to compute the probabilities of the possible results of measuring a spin observable (*e.g.*, S^2, S_z, S_y)

Conditions of enrollment: Physics 212 (Physics for Scientists & Engineers II), Physics 309 (Mathematical Methods of Physics), Math 203 (Multivariate Calculus), and Math 211 (Linear Algebra) are prerequisites for all students enrolled in this course.

How to get help: My *office hours* are M-Th 1:00 pm - 4:00 pm. If you can't come during any of these hours, I will be happy to make an appointment with you for another time. For me, *the* most enjoyable aspect of teaching is working with students one-on-one. *Please, please* come see me often—*especially* if you run into difficulties with concepts.

Class Attendance and Participation: Class meetings are TTh 10:00 am-11:50 am. Preparation for class, attendance, and participation will be rewarded.

Course Requirements

Grading: Your overall "Course Score" will be calculated using the following relative weights:

Reading Reflections	10%
Homework: Presentations	10%
Homework: Completion	20%
Subjective Bonus	10%
Exams	50%

Reading Reflections: It is nearly useless to read a physics text as you would a novel. "Studying" such a text requires that you be an *active* reader, that you remain engaged in a virtual and *appropriately skeptical* conversation with the author. You should, for example: (1) reserve doubt about everything the text says until it thoroughly convinces you, (2) think about situations to which the author's arguments might not apply, (3) make notes in the margins, (4) draw your own sketches and graphs to help visualize situations and functional behaviors, and *especially* (5) fill in all of the missing steps in any mathematical arguments. Indeed it is *all* too tempting to simply take the author's word for everything including the results of any calculation; after all, he or she wouldn't consciously *lie* to you, right? Well, yes; probably. But if you get into that habit, you will become a *passive* reader. Your mind forms no permanent "hooks" on which to store the information being presented. The time spent in the process may well be reduced, but will also have been essentially wasted.

Perhaps mathematician Paul R. Halmos gave the best advice about how to study: "*Study actively. Don't just read the text; fight it! Ask your own questions, look for your own examples, discover your own proofs.*" (*I Want to Be a Mathematician*, New York: Springer-Verlag, 1985). Similarly, Kate Wilson describes a critical reader as:

> "They **ask questions**; they **relate the text to other sources**; they think of examples to **corroborate** or **challenge** the text; they **play with the ideas**, extending or elaborating on them; they **relate** the text to their **own purposes or experience**. Furthermore, they "**criticize**" the text in the more traditional sense of the word, looking for **bias**, for poorly developed logic, for hidden assumptions. They locate the **author's position** through active "listening", relate this to their own ideas or experience, and **reshape their own understandings** in the light of the text."

Accordingly, in order to help you form or hone these important good study habits, I will ask you to produce and turn in a "Reading Reflection" for the week's reading. The reflection should be written as a paragraph, using complete sentences. The following questions may guide your reflection; you are *not* limited to these questions, nor do you need to answer them all each time. I am most interested in hearing your response to the reading.

> Which parts of the reading were the most difficult or challenging? Was anything surprising? Did you make a connection between this reading and previous course material? Can you speculate on what further applications one could do with these concepts? Which parts were most confusing – did you eventually figure them out, and if so, how? Did you mentally poke some holes in the author's argument? Did you try an example problem yourself – if so, how did it go? Did you have an "Aha!" moment of realization at some point? Do you have any questions of the material?

Beyond their effectiveness at helping you to stay engaged as you study, your Reading Reflection will also help me to understand those items and topics that may require more attention in class.

Reading reflections are due each Thursday by class time; we will begin covering the week's material on Tuesday, so you may choose to complete your reading earlier. Your Reading Reflection will be given full (3 pts) or partial credit (1 or 2 pts) *purely* on the basis of whether or not it appears that your good faith effort was involved and *not at all* on the basis of format, sophistication, vocabulary, correctness, etc. A full-credit reflection is composed of *your* insights, not just a summary/notes of the text. In order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out up to three "missing" Reading Reflections.

Homework: I will make regular Homework Assignments due at intervals of very approximately a week and a half to two weeks at the beginning of a specified class meeting.

As you surely know by now, the primary purpose of assigned problems in physics is ***absolutely not*** to see if you can get the right answer. Rather, it is for you to practice and then demonstrate that you have learned 1) how to determine the fundamental physical principles that are involved in a described situation and 2) how to apply those principles in a disciplined and orderly fashion. Of course, if you have learned how to do these things, you should expect to get the right answer too, but that is - really - of secondary importance. You will find - indeed, you probably have found - that, given time, an open book, lots of worked examples, and knowledge of the correct answer, it is very often possible to "get the answer" without the slightest understanding of what you are doing. Please guard against this; it is a complete waste of your time because it does not prepare you for, and it obviously will not work on, exams.

Accordingly, we are not - and you should not be - satisfied with problem "solutions" that simply consist of a series of mathematical manipulations leading to a result. Instead, the problem solutions you submit are to be "presented." In fact, you will present solutions to your classmates.

Approximately three or four homework problems will be assigned for each week's material. Most Tuesdays, at the beginning of class, I will randomly draw names to present solutions to individual problems or parts of problems. Students can expect to present about four times throughout the semester. It is up to *you* to take notes and ask questions and to get answers – from me or others in the class – to any remaining questions you have. This process is how you will a) self-reflect upon your own understanding of the material and b) write down the proper solutions for your continued studying. I will not provide written solutions to the homework.

As the audience, you are expected to ask questions when appropriate, and help the presenter as needed. It is my goal to be the "last resort" for questions, and to let you help one another work through the material. We will *all* make mistakes at the board or not know the answer to a question, and I expect everyone to be kind and respectful to one another as we work through this very difficult material. You will use a separate color of pen when writing solutions or taking notes during presentations, to distinguish between what you completed the night before and what you needed help with during presentations. **Please complete your original assignment in pencil or black ink.**

As the presenter, you can assume your audience has read and is familiar with the problem statement. Presentations should include written explanations (on the board) and thoughtful comments about what you are doing and, especially, why; should use well-defined and consistent notation (employing unique and meaningful subscripts and superscripts as necessary); should be accompanied by neatly drawn and carefully labeled diagrams; and should flow in a logical and orderly progression down the page. They should use more space for the written explanatory information than for the mathematics! They should ***not*** include lengthy, multiple-step, purely mathematical manipulations because it only serves to obscure the physics. Though you may have done this work on your paper, simply say something like "Solving equations 1, 2, and 3 for x, y, and z, we obtain ..." and give the result.

Presentation Grades: Presentations will be graded on the following scale:

- 5 points: Student presents and clearly explains an accurate or almost accurate solution, and can answer peer questions. Conceptual narrative is included as part of the solution. Minor errors in mathematics are fine.
- 4 points: Student has a fairly good understanding of the concept of the problem, but needs help from peers or instructor to complete the solution or correct major errors.
- 3 points: Student makes an attempt at presenting a solution but doesn't approach the problem correctly, or may have an accurate solution but cannot explain it or does not seem to understand it.
- 0 points: Student does not attempt to solve the problem, either by choice or because the student is absent when called upon.

If a student chooses not to present an assigned problem or is absent when called upon, I will present the solution. Your lowest presentation score will be dropped.

Completion Grade: You will be grading your own homework for completion, although I may periodically check the veracity of your grades. Based on your completion of the homework before class begins (which will be the portion of your submitted assignment that is in pencil or black ink), you will write a grade at the top of your assignment based on the following scale:

- 10 points: problem set is completely finished and correct before class starts.
- 8.5 points: all problems have been seriously attempted, but some contained major errors or some problems were incomplete.
- 6.5 points: all problems were started but the majority did not get very far -or- some problems were seriously attempted/completed but other problems were not really started.
- 0 points: no problems were attempted before class.

Unsubmitted problem sets will receive a 0. I do not accept late Homework Assignments, but, in order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out your two lowest scores. You are expected to be truthful and honest with your grades. Giving yourself 10 points when your assignment was not fully correct before class is a violation of the Academic Honesty policy. Writing in pencil or black ink during presentations is also a violation of the Academic Honesty policy.

I *strongly* encourage you to form study groups and to discuss with others your readings, questions that come up in and out of class, and how to go about solving problems. The work ***you*** turn in, however, must be ***yours***, based on the understanding ***you*** have acquired. When faced with two write-ups that show any signs of copying, I conclude that at least one person hasn't done the work. In such cases both papers will receive no credit.

Subjective Bonus: A small portion of your grade is also determined by my own overall subjective evaluation of your work in the class. Although it is subjective, my policy is that it will *not* be less than the average of your Reading Reflection and Homework scores. It allows me *only* to *reward* students who make contributions to the class that may not be fully recognized, who make particularly effective use of office hours, or who, in any other way, seem to deserve a bit of *additional* credit.

Exams: There will be two exams, which may be in-class, take-home, or some combination of the two. You may use your notes and homework that you generated during the course. You may not work with or gain assistance from anyone except members of the Westminster physics faculty. Of course, I trust you will do all your own work on the exams. If you are caught cheating on an exam you will receive an F for the exam for the first offense; for a second offense, an F for the entire course.

Academic Integrity: Please make sure that you have read and fully understood Westminster's Policy on Academic Honesty (and Dishonesty) (as listed in the 2023-2024 *Westminster Academic Catalog*). My sincere desire is to act as facilitator - not an enforcer! - for your studies in physics. Accordingly, I operate on the assumption that all of our interactions are based on openness, honesty, and good faith. I expect all of us to be honest and to treat each other fairly and with respect. Because our trust in each other is absolutely *crucial* to the effectiveness of our relationship, I take an uncompromising stance, as should you, on the necessity for sanctions when it is violated. The sanctions will depend on the severity of the violation and may include zero credit on the assignment in question or failure of the course. All violations of the Academic Honesty code will be reported to the Dean of Students.

During this course you may not use any solutions manual, friends' homework assignments from previous versions of this course, or previous exams. Using any of these resources is a violation of the Honor Code as it applies to this course. All graded work must be entirely your own.

Pronouns, Correct Names, and Inclusion: It is your right to be identified by your correct name and pronouns. I support people of all gender expressions and gender identities and welcome students to use whichever pronouns or names that best reflect who they are. In this spirit, I expect all students to also use the correct pronouns and names of classmates. Please inform me if my documentation reflects a name different than what you use and if you have any questions or concerns please contact me after class, by email, or during office hours.

Your rights under federal law

Section 504 of Rehabilitation Act of 1973/ADA: Westminster University is committed to providing equal access in higher education and to creating a learning environment that meets the needs of its diverse student body. If you are a student with a disability, or you think you may have a disability, we encourage you to meet with the office of Student Disability Services, which you can reach at disabilityservices@westminsteru.edu or 801-832-2272. You may wish to start by meeting with Natalie Atkinson, the Accessibility Coordinator. You can reach Natalie at natkinson@westminsteru.edu or 801-832-2608. Her office is in Gore 103.You can find more information, including how to request accommodations, at the *Student Disability Services website*.

Title IX: Westminster University is committed to providing a safe learning environment for all students that is free of all forms of discrimination and sexual harassment. This includes discrimination based on sexual orientation, gender identity and gender expression. If you (or someone you know) has experienced or experiences any of these incidents, know you are not alone. Westminster University has staff members trained to support you in navigating campus life, accessing health and counseling service, providing academic and housing accommodations, and more.

Please be aware all Westminster University faculty members are "mandatory reporters" which means if you tell me about a situation involving sexual harassment or gender discrimination, **I must report that information with the Title IX Coordinator.** Although I have to make the notification, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone, you can contact any of the following on-campus resources. These resources are confidential:

- Counseling Center (egibson@westminsteru.edu or 801-832-2237)
- Student Health Services (801-832-2239)
- Victim's Advocate – Stephanie Nolasco (advocate@westminsteru.edu)

If you wish to make a report directly to the Title IX Office, please complete the online reporting form located on the *Title IX website* or contact Mary Edmonds at 801-832-2496 or medmonds@westminsteru.edu. The Title IX website contains more information about resources, rights, policy and procedures, and updated information regarding our Title IX program at Westminster University.

Student Care: Westminster is committed to providing a safe and non-discriminatory environment for all members of the University community, including those whose gender identity and/or expression differs from the sex assigned to them at birth. Harassment and discrimination based on gender identity or expression is prohibited by the University and will not be tolerated. This includes refusal to address an individual by the gender they identify with. If you experience or witness prohibited conduct, or any form of discrimination or harassment, you should contact the Director of Student Care and Conduct listed below.

- Mary Edmonds (801-832-2496) or medmonds@westminsteru.edu

As a professor, just as with Title IX, I am required to report any information I obtain regarding discrimination or harassment to the Equal Opportunity Officer for further review.

Wellness Statement at Westminster University

Westminster University's integrated approach to wellness empowers students to live a healthy life and to develop self-efficacy toward their own wellness coupled with self-efficacy in the communities and social groups with which they are engaged. Through prevention and intervention programs/services students learn how a holistic approach to well-being can help them discover health, contentment, purpose, and connection. Integrated Wellness at Westminster encompasses social, intellectual, emotional, spiritual, physical, environmental, and financial aspects.

Westminster faculty care deeply about both your academic success and personal wellbeing. The University, and its faculty and staff, are all committed to advancing the mental health and wellbeing students, while acknowledging that a variety of issues, such as strained relationships, increased anxiety, alcohol/drug problems, and depression can directly affect students' academic performance. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact the *Counseling Center* at (801) 832-2465 for more information or to schedule an appointment. The *Counseling Center* is located on the lower level of Shaw Student Center.

Resources:

Integrated Wellness Student Resource Guide

SafeUT - connect to a licensed counselor that are ready to help you and listen to any sized crisis or concern. Help is immediate and confidential, and as easy as reaching for your phone and sending that first text.

Purple Basket - The Purple Basket is the basic needs pantry available to anyone within the Westminster community, no questions asked. Students can access a variety of foods, hygiene and baby products, and household items at no cost.

Bias Statement at Westminster University

A bias occurrence involves words and/or actions directed toward a person, group, or property, motivated by a bias against an aspect of one's identity or lived experience, which impacts participation in the campus community. The bias incident reporting process helps to create an inclusive campus community by providing resources and support to address student issues and concerns that may not rise to a student policy violation. If you believe that you have experienced or witnessed bias in the classroom, residence hall, or at a university-associated event or activity, you are encouraged to report it. To submit a bias incident report, go to the *Bias Report Form*. Bias incident reports may be submitted anonymously.