Physics 311
Analytical Mechanics
Fall, 2020

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

Instructor:
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Textbook:
Required: *Classical Mechanics*, John R. Taylor.

Course Description: Physics 311 is a junior/senior level course in classical mechanics – the physics of forces, mass, and energy as understood prior to the twentieth century, that is, before relativity and quantum mechanics. Classical Mechanics falls roughly under the domain of Newtonian Mechanics, but not exclusively so. There were major mathematical advances made to Classical Mechanics post Newton. Notably there was Leonhard Euler (1707-1783), Louis Lagrange (1736-1813), and Sir William Rowan Hamilton (1805-1865). Indeed, these three were responsible for reformulating classical mechanics into a separate, but equal, theory utilizing the calculus of variations.

Classical mechanics is a general framework rather than a description of a particular physical system. It describes and explains motion of objects (and groups of objects), subject to forces. It forms the basis for essentially all of modern physics - of course, Quantum Mechanics ultimately is required too, to extend the domain of applicability. But, Quantum mechanics nevertheless builds on classical mechanics. Classical mechanics lies at the heart of a huge variety of technology and natural phenomena. The tools and topics we cover in this course set the stage for applications in such diverse fields as engineering, planetary and atmospheric sciences, fluid mechanics, and thermodynamics. Classical mechanics is an extraordinarily practical branch of physics - until the advent of computers it was hard to apply to most realistic systems, but today it is commonplace to calculate nonlinear phenomena, and extraordinarily complex models, building on the fundamentals we will cover this term. Classical mechanics is one of the oldest branches of physics, but it is still very much alive today, particularly in the domains of mechanical and civil engineering, fluid mechanics, statistical mechanics, and chaos theory. And it provides "a wonderful opportunity" to learn a variety of mathematical techniques used throughout physics!

We will be looking at problems that are central to most of classical physics: trajectories, oscillations, orbits, and central force motion. The topics in Phys 311 are among the greatest intellectual achievements of humans. Don't be surprised if you have to think and work hard to master this!

Learning Goals: 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 classical mechanics problem to a 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 mechanics problem. Students should be able to achieve physical insight through the mathematics of a problem.
- **Visualize the problem:** Students should be able to sketch the physical parameters of a problem including sketching the physical situation and the coordinates (e.g., equipotential lines, a resonance curve, a pendulum with its angle as the coordinate,) as appropriate for a particular problem.
- **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 direction of a force, dependence on coordinate variables, and behavior at large distances or long times. For all problems, students should be able to justify the reasonableness of a solution they have reached, by methods such as checking the symmetry of the solution, looking at limiting or special cases, relating to cases with known solutions, checking units, dimensional analysis, and/or checking the scale/order of magnitude of the answer.
- **Organized knowledge:** Students should be able to articulate the big ideas from each chapter, section, and/or class period, 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, and make connections/links between different concepts.

- **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. Students should be able to write up problem solutions that are well-organized, clear, and easy to read.
- **Build on Earlier Material:** Students should deepen their understanding of Phys 211 and Phys 309 material, *i.e*., the course should build on earlier material.
- **Problem-solving techniques:** Students should continue to develop their skills in choosing and applying the problem-solving technique that is appropriate to a particular problem. This indicates that they have learned the essential features of different problem-solving techniques (e.g., solving differential equations with constant coefficients, using Fourier series methods to solve PDEs with appropriate boundary conditions, etc.). They should be able to apply these problem-solving approaches to novel contexts (*i.e*., to solve problems which do not map directly to those in the book), indicating that they understand the essential features of the technique rather than just the mechanics of its application. Students should move away from using templates. They should be able to justify their approach for solving a particular problem.
    - **Vectors and coordinate systems:** Students should be able to compute dot and cross products and solve vector equations without reference to books or external materials, and they should demonstrate comfort with these mathematical tools. Students should recognize whether variables are scalars or vectors, and vector and scalar variables should be clearly distinguishable in students' written work. Students should be able to project a given vector into components in multiple coordinate systems, and to choose the most appropriate coordinate system in order to solve a given problem. Students should be able compute surface and volume integrals in Cartesian, cylindrical, and spherical coordinate systems (*i.e*., know the expressions for dV in these coordinate systems and how to apply them in a particular situation).
    - **Approximations:** Students should be able to recognize when approximations are useful, and use them effectively (*e.g*., recognize when air resistance is a small effect). Students should be able to indicate how many terms of a series solution must be retained to obtain a solution of a given order, and should be able to identify when a Taylor expansion is appropriate and what the variable of expansion is in a given problem.
    - **Series expansions:** Students should be able to recognize when a series expansion is appropriate to approximate a solution, and expand a Taylor Series beyond zeroth order.
    - **Orthogonality:** Students should recognize that both vectors and functions can be orthogonal and that any function can be built from a complete orthonormal basis. Students should be able to expand functions in an orthonormal basis (e.g. find the coefficients for a Fourier series) and interpret the coefficients physically. Students should be able to determine from the even or odd symmetry of a function which terms in the expansion are zero. Students should be able to define the terms complete and orthonormal in the context of an orthonormal basis.
    - **Differential equations:** Given a physical situation, students should be able to write down the required ordinary differential equation, identify the method of solution, and correctly calculate the answer. Students should be able to identify the type of differential equation (homogeneous, linear vs. nonlinear, constant vs. variable coefficients, 1st, 2nd, or higher order, etc.) and choose the correct method to solve that type of ODE. Students should be able to explain how the type of differential equation helps determine which methods of solution will be applicable.
    - **Superposition:** Students should recognize that – in a linear system – the solutions may be formed by superposition of components.
- **Problem-solving strategy:** Students should be able to draw upon an organized set of content knowledge, and apply problem-solving techniques to that knowledge in order to organize and carry out long analyses of physical problems. They should be able to connect the pieces of a problem to reach the final solution. They should recognize that wrong turns are valuable in learning the material, be able to recover from their mistakes, and persist in working to the solution even though they don't necessarily see the path to the solution when they begin the problem. Students should be able to articulate what it is that needs to be solved in a particular problem and know when they have solved it.
- **Intellectual maturity:** Students should accept responsibility for their own learning. They should be aware of what they do and don't understand about physical phenomena and classes of problem. This is evidenced by asking sophisticated, specific questions; being able to articulate where in a problem they experienced difficulty; and take action to move beyond that difficulty.

Subject Scale Learning Goals

The goals below pertain to specific areas in the study of classical mechanics that are to be learned in this course.

Physics contexts	Math techniques used
Kinematics. Position, velocity, and acceleration.	**Vectors, curvilinear coordinate systems.** Quick review of vector addition, dot and cross products. Spherical and cylindrical coordinate systems, simple derivatives.
Newton's Laws. Reference frames, $\vec{a} = \vec{F}^{net}/m$, 1D motion, 3D motion.	**ODEs.** Guess and check, linear ODEs, constant coefficient ODEs.
Conservation Laws. Kinetic and potential energy, small oscillations, momentum and angular momentum.	**Line integrals. Gradient operator. Taylor expansion.**
Simple harmonic oscillator. Damped and driven oscillators, resonance.	**Complex numbers. ODEs. Fourier series. Fourier transforms.**
Lagrangian mechanics	**Calculus of variations. PDEs. Separation of Variables**
Hamiltonian mechanics and chaos	**Nonlinear differential equations:** equilibrium points and numerical methods
Gravitation.	**Surface and volume integrals. Gauss' theorem. Legendre polynomials. Laplace equation. Selected Vector Calculus. Delta functions**

Vectors, Curvilinear Coordinate Systems, and Kinematics

Goals

- Students should recognize that $\dot{x}$ is the same as *dx/dt*, and identify these mathematical terms with the physical idea of rate of change of position with time. Students should similarly recognize that $\dot{v}$ is the same as *dv/dt*, and identify these mathematical terms with the physical idea of rate of change of velocity with time.
- Students should recognize that $\dot{x} = v$ and $\dot{v} = a$. Students should be able to explain the physical meaning of position, velocity, and acceleration and describe how they are related to each other.
- Students should be able to break a vector equation in to three equations – one for each component.
- Students should be able to solve problems in plane polar coordinates. They should be able to draw $\hat{r}$, $\hat{\phi}$, and $\hat{\theta}$ for a given point.

ODEs and Newton's Laws

Goals

- Given a physical situation, students should be able to use Newton's laws to write down the required ordinary differential equation, identify the method of solution, and correctly calculate the answer. Students should be able to identify the type of differential equation (homogeneous, linear vs. nonlinear, constant vs. variable coefficients, 1st, 2nd, or higher order, etc.) and choose the correct method to solve that type of ODE. Students should be able to explain how the type of differential equation helps determine which methods of solution will be applicable.
- Students should be able to use initial conditions as part of their solutions to ODEs.
- Students should be able to identify (and draw) an appropriate coordinate system before beginning to write down an ODE from a physical situation.
- Students should be able to make physical sense of the mathematical solution to a differential equation, which includes testing limiting cases and sketching the function.
- Students should be able to determine if an ODE is separable, be able to separate the equation if possible, and solve separable ODEs.
- Students should be able to solve first order linear ODEs with constant coefficients.

- Students should have solutions to several common ODEs at their fingertips (*i.e.*, be able to give the solution to the ODE without calculation or reference to external materials). These include the ODEs whose solutions are sine and cosine, exponentials, and linear function.
- Students should be able to decide if a given differential equation can be solved analytically. If it cannot, they should be able to use Mathematica to find a solution, and recognize if Mathematica has returned a bogus result.
- Students should be able to translate a given physical situation for an object moving with air resistance to a correct differential equation, including the correct sign for each term of the equation.
- Students should be able to predict the direction of drag when given the velocity of a moving object.
- Students should be able to describe the concept of terminal velocity and be able to calculate it for a given object and form of the drag force (*i.e.*, quadratic, linear, or both terms).
- Students should be able to explain what quadratic and linear drag are, and that they are limiting cases of the full equation for drag which is a combination of both.
- Students should be able to list the variables that air resistance depends on (*e.g.*, velocity of the object, viscosity of the liquid, shape of object, etc.) and should be able to predict whether the air resistance increases or decreases when these variables are changed.
- Students should be able to sketch the qualitative path of an object given the differential equation involving air drag and the initial conditions.

Taylor Expansion

Goals

- Students should be able to take the Taylor series expansion around zero for common functions (cosine, sine, exponential, $1/(1+x)$, $\sqrt{1+x}$, $\ln(1+x)$ and express the solution both as a list of terms and using summation notation.
- Students should recognize that Taylor series are often used when a variable is <<1 and be able to choose an appropriate variable (or combination of variables) to expand in for a given situation.
- Students should be able to explain when a Taylor expansion is exact, a good approximation, or not a good approximation (*e.g.*, near the point of expansion the Taylor expansion will be a good approximation with only a few terms, but father away more terms are needed for a good approximation of the actual value. To be exact at any point, one may need an infinite number of terms.)

Gradient Operator

Goals

- Students should be able to calculate the gradient of a function in Cartesian coordinates without reference to external sources such as a textbook. Students should be able to compute the gradient of a function in cylindrical and spherical coordinates with the use of a reference.
- Students should be able to explain the physical meaning of the gradient, predict relative direction and magnitude for several points given equipotential lines, and relate the gradient to the 1D idea of slope.

Conservative Forces

Goals

- Students should be able to calculate the curl of a function in Cartesian coordinates without reference to external sources such as a textbook. Students should be able to compute the curl of a function in cylindrical and spherical coordinates with the use of a reference.
- Students should be able to determine from an equation or a drawn vector field whether the underlying force is conservative.
- Students should be able to explain both conceptually and mathematically how force ($\vec{F}$) and potential (U) are related and when this relation is applicable.
- Students should be able to determine the relative magnitude and a direction of a force at several points on a set of drawn equipotential lines.
- Students should be able to determine the direction of a force at a point based on a plot of U vs. position (in 1D). Students should be able to recognize equilibrium points in the plot and should be able to determine if these points are stable given the function $U(x)$.

Line Integrals

Goals

- Students should be able to take the line integral $\int_{\vec{r}_1}^{\vec{r}_2} \vec{F} \cdot d\vec{r}$ and should be able to explain what this sum means physically (i.e., the sum of dot products along a line).
- Students should be able to predict the magnitude (zero, non-zero) of line integrals for a given path in a drawn vector field.

Simple Harmonic Oscillator

Goals

- Students should be able to solve second order linear ODEs with constant coefficients.
- Students should be able to write down Hooke's Law and explain what each variable means. Students should be able to explain the physical meaning of this equation.
- Students should be able to explain, using the idea of a Taylor series, why Hooke's law is a good approximation for the force near any stable equilibrium. Students should be able to give a physical example of a system that obeys Hooke's law that is not a spring.
- Students should be able to write the differential equation for harmonic motion with and without damping and driving forces, and should be able to explain the physical meaning of each term.
- Students should be able to draw a phase diagram for a physically or mathematically given oscillation and vice-versa. Students should be able to explain the physical meaning of the crossing points on the x and $\dot{x}$ axes.
- Students should be able to explain, both mathematically and physically, how underdamped, overdamped, and critically damped motion come from a single differential equation.
- Students should be able to determine from a given physical situation if the motion will be over-, under-, or critically-damped.
- Students should be able to predict whether ω increases, decreases, or stays the same for damped compared to simple harmonic motion.
- Students should be able to use real-world examples to explain how critically damped motion can be useful.
- Students should be able to explain the concept of resonance both conceptually and mathematically.
- Students should be able to sketch the motion of simple harmonic oscillators, with and without damping and driving forces on the same set of axis, and should have qualitatively correct the relative amplitudes and frequencies.
- Students should be able to use Fourier Series to solve for the motion of a harmonic oscillator driven with a given arbitrary periodic forcing.

Fourier Series and Transforms

Goals

- Students should be able to expand functions in an orthonormal basis (*e.g.*, find the coefficients for a Fourier series) and interpret the coefficients physically. Students should be able to determine from the even or odd symmetry of a function which terms in the expansion are zero. Students should be able to define the terms complete and orthonormal in the context of an orthonormal basis.
- Students should be able to match graphs of functions to graphs of their Fourier transforms.

PDEs and Separation of Variables

Goals

- Students should be able to explain the difference between ODEs and PDEs and should be able to give examples of physical situations that lead to each.
- Students should be able to derive the relevant separated ODEs in Cartesian coordinates from Laplace's equation.
- Students should be able to use boundary conditions to solve Laplace's equation using separation of variables in 2D Cartesian and plane polar coordinates. For plane polar coordinates, students may refer to a book for the relevant separated ODEs.

Lagrangian/Hamiltonian Mechanics

Goals

- Students should be able to distinguish coordinates describing (Newtonian) forces and those describing motion; recognize the role of constraints in describing the evolution of a system.
- Students should be able to use productive intuitions to develop formal mathematical language for defining generalized coordinates.
- Students should be able to perform a step-by-step analysis—defining generalized coordinates, writing down the Lagrangian, and solving for equations of motion for a number of different problems.

- Students should be able to reflect upon similarities and differences between the Newtonian and Lagrangian methods of solution.
- Students should be able to solve variational problems using the Euler equation with constraints (Lagrange multipliers).
- Students should be able to apply the Euler-Lagrange and Hamilton formalisms to obtain and solve the equations of motion for mechanical systems.

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- Students should be able to use boundary conditions to solve Laplace's equation using separation of variables in 2D Cartesian and plane polar coordinates. For plane polar coordinates, students may refer to a book for the relevant separated ODEs.

Gravitation

Goals

- Students should be able to apply Gauss's law in the context of a gravitation problem.
- Students should be able to explain what criteria must be satisfied for Gauss's Law to be useful, and should be able to predict mass distributions whose gravitational field can and cannot be determined using Gauss's law.
- Students should be able to find the total mass of an object for a given mass density $\rho(\vec{r})$ using volume integration.
- Students should be able to translate the physical situation in to an appropriate integral to calculate the gravitational force at a particular point away from some simple mass distributions (a half-infinite line of charge, a ring of charge while on the axis of the ring, etc.).

My goal is to have minimal lecturing and lots of discussion from your readings. We'll do hands-on explorations of physical systems as appropriate. 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.

Conditions of enrollment: Physics 212 (Physics for Scientists & Engineers II), Physics 309 (Mathematical Methods of Physics), Math 202 (Calculus II), and Math 203 (Multivariate Calculus) are prerequisites for all students enrolled in this course.

How to get help: My *office hours* are M 3:00 pm – 5:00 pm, W 1:00 pm – 4:00 pm, and TTh 4:00 pm – 5:00 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 10:00am-11:50am. Preparation for class, attendance, and participation will be rewarded.

Course Requirements

Reading Memos: 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)

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 Memo" at the beginning of each day for which there is assigned reading. A "Reading Memo" is an informal running collection of thoughts about and reactions to the material in the text. As you study, keep a pencil in hand and note any questions that occur to you; any surprises, insights, or connections to other things you know about; anything you think may be wrong or incomplete and why you think so; anything you think could be said more clearly and your proposed revision; etc. Beyond their effectiveness at helping you to stay engaged as you study, your Reading Memos will also help me to understand those items and topics that may require more attention in class.

Your Reading Memos will be given full (2 pts) or half credit (1 pt) *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. In order to allow for extraordinary circumstances (*including* absence for *any* reason), I will throw out up to three "missing" Reading Memos.

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." By this we mean that they should be readable by someone who does not have access to the problem statement; should include written explanations 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. Do this kind of work on scratch paper and simply say something like "Solving equations 1, 2, and 3 for x, y, and z, we obtain ..." and give the result.

I will not "check" your homework solutions in any in-depth fashion; it is up to *you* to check them against the solutions that I will hand out and to get answers—from me or others in the class—to any remaining questions you have. I will look over each problem of your work only casually and assign a holistic score of 5- 10 for each problem. See the Homework Rubric for more information, but briefly: a 9 or 10 point assignment work shows a correct understanding of the concepts and explains them clearly to a new learner. A 7 or 8 point assignment is generally correct but not clearly explained, or contains misunderstandings but is clearly written. A 5 or 6 point assignment demonstrates little understanding of the concepts or is so poorly written (or absent) that the reader can't understand. Unsubmitted problems or problems submitted with minimal development will receive a 0.

Problems that receive a score of 5-8 may be redone and resubmitted within 5 calendar days from the return of the original work. All resubmitted problems must include a thoughtful reflection on your original work and mistakes. The final score will be the average of the score on the original work and the score on the resubmitted work.

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.

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.

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 Memo 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 to three exams, either in-class or take home. You may use your textbook and notes 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, you will receive an F for the entire course.

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

Reading Memos	10%
Homework	20%
Subjective Bonus	10%
Exams	20-30% each

Academic Integrity: Please make sure that you have read and fully understood Westminster's Policy on Academic Honesty (and Dishonesty) (as listed in the 2020-2021 *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 first occurrence of academic dishonesty will result in a score of zero on that assignment or exam; the second occurrence will result in failure of the course.

Face Covering Requirement: The College's Policy 521 on Complying with COVID-19 Guidance governs all students, faculty, staff, and campus visitors in all College-owned, leased, or operated facilities. Face coverings MUST be properly worn at ALL times in ALL classrooms, both indoor and outdoor. Accordingly, no consumption of any food will be allowed in classrooms, both indoor and outdoor.

As the instructor of this course, I shall comply fully with Westminster College's policy. Students who attempt to enter a classroom without face coverings will be asked by the instructor to wear face coverings prior to entry, and will not be admitted into the classroom without a face covering. Students who remove their face coverings at any time during a class session will be asked by the instructor to resume wearing their face coverings.

Students who do not comply with a request by a Westminster College instructor to wear a face covering in accordance with the College's Policy may be subject to disciplinary actions per the rules, regulations, and policies of Westminster College, including but not limited to the Student Handbook.

Non-compliance with this policy may result in disciplinary action, up to and including any of the following:

- dismissal from the course(s)
- removal from campus housing (if applicable)
- dismissal from the College

To immediately protect the health and well-being of all students, instructors, and staff, instructors reserve the right to cancel or terminate any class session at which any student fails to comply with faculty or staff request to wear a mask in accordance with College policy.

Students are strongly encouraged to identify to their instructor any student or instructor not in compliance. Non-compliance may be anonymously reported via the Incident Reporting Form (*https://westminstercollege.edu/about/risk-management/coronavirus-covid-19-resources/covid-19-comments-questions-and-incident-reporting*)

Your rights under federal laws:

Section 504 of Rehabilitation Act of 1973/ADA: Westminster college is committed to provide equal access in higher education. If you need disability-related accommodations in this class, have emergency medical information you wish to share with me, or need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class or in my office. Disability Services authorizes disability-related academic accommodations in cooperation with the students themselves and their instructors. Students who need academic accommodations or have questions about their eligibility should contact Jody Katz, Director of Disability Services & Testing Center, in the basement of Giovale Library (801-832-2272) or email *disabilityservices@westminstercollege.edu*.

Title IX: Westminster College 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 College 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 College faculty members are "mandated reporters," meaning **if you tell me about a situation involving sexual harassment or gender discrimination, I must share 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 privately, you can contact any of the following on-campus resources:

- Counseling Center (*egibson@westminstercollege.edu* or 801-832-2237)
- Student Health Services (801-832-2239)
- Victim's Advocate (*advocate@westminstercollege.edu*)

If you wish to make a report directly to the Title IX Office, please complete the online reporting form located on *www.westminstercollege.edu/titleix* or call 801-832-2262. The Title IX website contains more information about resources, rights, policy and procedures, and updated information regarding our Title IX program at Westminster College.

Equal Opportunity: Title VI of the Civil Rights Act of 1964 prohibits discrimination based on race, color, or national origin in any program or activity receiving federal financial assistance. In addition to these, Westminster's Equal Opportunity policy prohibits discrimination or harassment based on ethnicity, age, religion, military status, or genetic information in any of its programs or activities. If you encounter this type of discrimination or harassment, or feel that you have been retaliated against for reporting prohibited conduct or participating in any related proceeding, you should contact an Equal Opportunity Representative listed below.

Julie Freestone (801-832-2573 or *jfreestone@westminstercollege.edu*)
Kat Thomas (801-832-2262 or *kthomas@westminstercollege.edu*)

The equal opportunity policy and procedures can be accessed from the Student Life webpage.

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