

Physics I with Trigonometry– Regis University

PH 202A RU01 – Fall 2019 – 3 credit hours

Monday, Wednesday & Friday, 9AM – 9:50AM, in Science 130

Website: <http://worldclass.regis.edu>

Catalog Description: PH 202A. GENERAL PHYSICS WITH TRIGONOMETRY I (3). Discusses fundamental concepts of motion, including Newton's Laws and the conservation of energy, momentum, and angular momentum. Focuses on the development of quantitative and qualitative problem-solving skills. Co-requisite: PH 205A. Prerequisite(s): MT 260 or placement into MT 360A. NOTE: This course has been approved to satisfy the core Category II natural science with laboratory requirement when taken with PH 205A.

Instructor:

Evan Tilton, Ph.D.

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Office: Carroll Hall 108C (inside the Math & Physics Suite)

Phone: 303-458-4166

Office Hours: Monday 1pm-3pm; Tuesday 1pm-2pm; Wednesday 1pm-2pm
Other times by appointment, or feel free to just stop by and see if I'm free.

Email is the most reliable way to contact me.

STUDENT LEARNING OUTCOMES:

At the end of this course, you should be able to

- State the fundamental and macroscopic interaction categories, the laws of conservation of energy, momentum, and angular momentum, and Newton's laws of motion;
- Define and explain the relations among momentum, force, impulse, energy, power, work, angular momentum, and torque, and among position, displacement, velocity, speed, and acceleration;
- Solve quantitative problems describing motion, starting from fundamental principles such as the laws of conservation of momentum, energy, and angular momentum, and applying mathematics including algebra, geometry, and trigonometry;
- Apply the methods of solution to standard problems involving static systems, linear motion on inclined surfaces, coupled objects, and energy conservation and transformation;
- Reason qualitatively about motion in physical systems, determining how changes in parameters of the system are likely to affect its behavior;
- Read and apply principles stated in a quantitative text in which mathematics is used in both descriptive and prescriptive ways.

PH202A contributes to the overall Physics Departmental Learning Outcomes (SLOs; relevant portions italicized):

1. *Knowledge of the fundamental principles of analytical mechanics, special relativity, electricity and magnetism, quantum mechanics, and statistical mechanics.*
2. *Ability to apply the principles of physics to solve qualitative and quantitative problems using both analytical and computational methods.*
3. *Ability to design and conduct experiments.*
4. *An understanding of professional and ethical responsibilities*
5. *Ability to communicate effectively, both orally and in writing*

COREQUISITES: PH202A and PH 205A are corequisites of each other.

PREREQUISITES: You are expected to be comfortable with functions, algebra, geometry, trigonometry, and graphing, all of which will be used throughout this course. We will use symbolic, algebraic notation and manipulation liberally. You are not expected to have studied calculus. The math prerequisite is thus MT 260 or placement into MT 360A.

COURSE MATERIALS:

Required materials: You must have:

- **Pens or pencils and paper or notebooks** for working problems, both in class and as homework.
- **A scientific calculator.** Exams, homework, and in-class exercises will require numeric calculations. It is your responsibility to understand how to use your calculator prior to exams.
- **Access to a computer with internet capabilities.** Materials will be posted on WorldClass and sent out via email, and other websites will be used occasionally. You are expected to be able to download files from both locations and check your Regis email frequently. You may be required to use Excel (or similar) to organize data; laptops are available for use in the classroom.

Required text: *OpenStax College Physics* by Urone, Hinrichs, Dirks, Sharma, et al. (Print ISBN:978-1-938168-00-0; Digital ISBN:978-1-947172-01-2). It is **freely** available online at <https://openstax.org/details/college-physics>. If you dislike digital books, a printed edition can be purchased online for a modest fee. Be sure to look at the Student Resources section of the website (<https://openstax.org/details/college-physics?Student%20resources>), which has useful tools such as a Solution Manual for practice problems.

Additional resources:

- The Learning Commons: The Learning Commons offers free, in-person and online tutoring for all students. I highly recommend this resource for help with math and physics! They usually post their schedule after the first week of classes, so keep an eye out for that. They offer help via three main ways:
 1. The Writing Center: They work with writers in all subjects and at any stage, from brainstorming to rough drafts to polishing a final draft.
 2. Tutoring: They offer one-on-one sessions and study groups. Subjects include math, biology, physics, chemistry, nursing, pharmacy, computer science, business, neuroscience, psychology, humanities, languages, communication, critical reading, and study skills.
 3. Academic Success Workshops offered include study skills, time management, APA, and more.For more information and to make an appointment, visit regis.edu/tlc or contact them at tlc@regis.edu.

GRADING:

The course grades will be broken down into six categories:

1. 30% Midterm exams (3 total)
2. 15% Cumulative final exam
3. 15% Participation
4. 40% Homework

A	Outstanding scholarship.	>88	C	Satisfactory command of material.	68 – 71.99
A-		85 – 88	C-		65 – 67.99
B+		82 – 84.99	D+		62 – 64.99
B	Strong command of material.	78 – 81.99	D	Unsatisfactory command of material.	58 – 61.99
B-		75 – 77.99	D-		55 – 57.99
C+		72 – 74.99	F	No credit.	<55

You can expect your overall course grade to correspond to the above letter grades. However, I reserve the right to assign higher grades than would result from this table according to my judgement of the difficulty of the assignments. If necessary, the overall course grade distribution at the end of the

semester will be adjusted to ensure that a minimum of 80% of students receive a grade of C- or better. No final grades will be adjusted or curved downward relative to the above table under any circumstances. For example, if everyone earned above an 88%, then everyone would get an A, so it is in your interest to work together and help each other learn physics. The contributing categories are as follows:

- **Midterm exams:** There will be three midterm exams. Tentative, approximate exam dates are given on the schedule in this syllabus. Firm exam dates will be announced 2-3 classes in advance. These exams will test your understanding of the content from assigned readings, class time, and homework problems. Exams could include a variety of types of questions, including but necessarily not limited to:
 - Qualitative, conceptual questions that may be either multiple choice, multiple choice with explanation, short answer, etc. These types of questions will be similar to the conceptual questions in the textbook, conceptual questions I ask you in class or on homework, and in-class activities.
 - Quantitative problems similar in scope to the in-class example and assigned homework problems.

The exams will not be tests of what you can memorize; they will require you to apply the principles that you have learned to **new situations that you have never seen before**. A key part of your studying should thus be solving problems that you have never seen before without looking at the solution until you have solved it yourself. All midterm exams are cumulative, but they will focus most heavily on material introduced since the previous midterm.

For each exam, you may bring a single, hand-written equation sheet, no larger than both sides of an 8.5x11inch piece of paper. Equation sheets will be collected with the exam and returned to you after the exam is graded. **Your sheet may not contain fully-worked example problems.** Equation sheets that include fully worked example problems or other significantly non-reminder-like information will be penalized with a substantial reduction of your exam score per my discretion. Calculators without internet access or communication capabilities are permitted during exams. No other electronic devices, including smartphone calculators, are permitted during exams (except as accommodations for documented disabilities per Regis's accessibility policies).

Students may only make-up a missed exam if adequate documentation is provided for an excused absence BEFORE the exam day (e.g., Regis sponsored activities, such as sports, travel to academic conferences, etc., illness that can be verified by a doctor's note, death in the family, etc.). I will follow-up on any documentation that you provide and then decide if your absence is excused; if it is, we will work together to schedule the soonest possible time to make-up the missed exam. The make-up exam may be different from the in-class exam, at my discretion.

- **Final exam:** The cumulative final exam will take place on December 13 at 8am and will have a more holistic focus on the course's material. (I'm sorry for the time; I can't change it, unfortunately, because it is set at the university level.)
- **Participation:** Because we will explore a large variety of topics and activities in class, including some that will not be practiced in any other context, I expect that you will attend and participate fully in every class. More than 8 unexcused absences (about 20% of the course) may result in automatic failure of the course.

You will have an online reading survey to complete every time that there is a reading assignment; these will contribute to your participation score. Additionally, we will use Plickers to answer questions in class -- these will be graded for participation but not correctness.

However, I am well aware that stuff comes up for everyone sometimes, so I will drop your three lowest participation grades. However, I strongly advise that you do not miss class unless absolutely necessary -- skipping classes is a recipe for disaster. Excused absences due to

athletics, Regis sponsored activities, and medical absences with sufficient documentation (hardcopies and emails submitted in advance) will be taken into consideration and excused when appropriate, in accordance with Regis policy and my discretion. Regardless of the reason, you alone are responsible for getting and understanding all material from the missed classes.

- **Homework:** Homework is the most important activity for learning physics. Physics is a skill rather than something that can be memorized, so you must practice it daily, just like a sport or musical instrument. Homework will be assigned nearly every week. All homework will be of the old-fashioned written variety and should be turned in on paper. Written homework is always due at the **beginning** of class on the due date. No late homework will be accepted. You should solve problems habitually, as you encounter new concepts, rather than letting it pile up until the last minute. You should use a diversity of resources to help you with homework: visit me in office hours, schedule time with the free physics tutors, and collaborate with friends. You should also treat homework as the bare minimum number of problems you need to solve; most people will need to solve more practice problems to sufficiently prepare for exams.

To ensure a quick grading turn-around time, a randomly selected subset of the assigned problems may be graded on some occasions.

In addition to seeking help from me or tutors, you are encouraged to collaborate on homework **within the guidelines for academic integrity**. While everyone understands what the honor code means on quizzes and exams, there is often confusion on what it means for homework. Students are encouraged to work together on homework, but your write-ups and submissions must be independent. Copying, whether by hand or cut-and-paste on your computer, constitutes cheating, and will be handled accordingly. The best way to ensure you understand the assigned material (on which you will be tested later!) is to split off from the group when writing up or submitting your answers. A good approach is to try the problems on your own, collaborate with a group to figure out what approach will solve the harder ones, and then split off to implement and write-up that solution on your own. **Anyone that you collaborated with must be acknowledged in writing on the assignment.** *When in doubt about plagiarism, quoting, or collaboration, consult with me – getting a homework problem done a few minutes quicker is not worth potentially irreparable damage to your college career because you got caught cheating!*

Problems will be graded for both correctness and clarity. It is not enough to arrive at a correct answer; you must show a logical process that starts from known, identified physics principles. Your solutions must be written clearly and include diagrams where appropriate. You **must** work the problems with algebraic symbols before substituting in numbers. If a number has units, you must write them together with the number (every time). Once we cover the topic, you are expected to use vector notation correctly, maintaining the distinctions among a vector, its components, and its magnitude. In particular, please remember that a vector can never be connected to a scalar by an equals sign, since they are fundamentally different classes of mathematical objects, and that the magnitude of a vector can never be a negative number, although any of the components of the vector can be negative. If the problem has a numerical result, credit will be deducted if the answer is unreasonable unless you explain that it is unreasonable.

More specifically, each graded problem (with the exception of initial “math review” assignments) will be graded for:

- Completeness and Clarity (30%) – Is each part of the problem fully addressed in a good faith effort? Regardless of correctness, is your reasoning transparent enough, via the words or diagrams, for a **peer** to understand it?
- Model (20%) – Is your solution using the correct physical principles and applying them correctly?

- Good Notation (20%) – Is your algebra conducted fully with algebraic symbols? Are units included wherever necessary? Are vectors notated correctly?
- Valid Math (20%) – Are all math steps shown, and are they correct?
- Plausibility (10%) – Does your result have a plausible sign, magnitude, and/or units? If not, have you noted that you recognize it as implausible and why?

Additionally, after the solutions have been posted, **homework may be corrected with a color-contrasting pen or pencil** up until the next homework due date. Up to 75% of lost credit in the Model and Valid Math categories may be earned back. This means, for example, that if your initial attempt is entirely incorrect but well explained, plausible, and correctly notated, you may receive a 60% for the problem due to no credit in Model and Valid Math but full credit in the other categories. This 60% can be raised back up to 90% if you correct your work in light of the solutions. However, you may not simply copy the solutions onto your paper; you must carefully show how you erred and how it should be fixed. For example, you might write something like “In this step, I assumed constant velocity. However, I should have included the acceleration due to the force of friction. Taking this into account, the equation becomes....”

If your solution reflects a lack of careful attention in general, due to problems such as illegibility, it may simply be returned ungraded. Problems that are given zero credit for insufficient attention may not be corrected for credit at all.

This grading system rewards good-faith efforts at engaging with the problems. Because you have multiple opportunities to engage with and revise the problem, I will not comment extensively on the work when I grade it; you are expected to review the solutions online and revise appropriately. You are always welcome to seek help with these tasks in office hours.

CLASSROOM GROUND RULES

For the benefit of your fellow students and your instructor, you are expected to practice common courtesy in all course interactions. For example:

- Act as mature and responsible adults always.
- Show up to class on time and be prepared to learn when class starts.
- Unless directed to do so, don't leave class early and **don't start packing up before class ends**.

If you follow these requests, I will be able to always extend similar courtesies to you, such as always ending class on time and dealing with you as responsible individuals and as adults.

Additionally, please observe these additional policies:

- **Electronics usage:** It is *strongly* suggested that you use no electronics during class other than those required for the day's activities. However, I understand that there are potentially good reasons that you may feel that electronics usage benefits your personal study habits. You are welcome to use phones, tablets, or laptops in class for notetaking, accessing the ebook, or other approved uses, however you may **only** use those devices for those purposes. Other uses are not allowed and **will** result in your being asked to leave to avoid distracting others.
- **Diversity and Inclusion:** A commitment to inclusivity will be especially important in our classroom, which will feature frequent group collaboration. I as an instructor and we as a class value diversity of backgrounds, opinions, and experiences. I embrace the diversity of race, age, culture, religion, politics, veteran status, sexual orientation, gender identity and gender expression, disability, and nationalities, as well as other visible and invisible categories, that you bring with you to our shared study of physics. I expect that all students will contribute to a welcoming, respectful, and inclusive environment. This shared responsibility for respect and

inclusion is necessary for the free exchange of ideas and learning, and it is a core feature of an effective learning environment.

Class rosters are provided to the instructor with the student's legal name. I and the rest of the class will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records, and feel free to correct me any time that I make a mistake.

The following are a few basic social guidelines that make explicit certain norms of social behavior that help uphold the values listed above. If you mess up on any of the below, don't panic: we all, including all your instructors, make mistakes sometimes. Apologize, reflect, move forward.

1. **Raise all voices.** During group work and discussions, pay attention to who is contributing. Invite contributions from quieter members of the group, and be conscientious of not dominating the conversation. I understand that it can be exciting to discuss a new idea, but always strive to listen (rather than just waiting your turn to speak).
 2. **No feigning surprise.** In a learning environment, it is very important that people feel comfortable saying "I don't know" or "I don't understand." Therefore, please do not act surprised when someone says they don't know something, whether it is regarding a technical or non-technical subject (e.g. "What?! I can't believe you don't know what X is!"). Feigning surprise has no social or educational benefit: it only makes others feel worse.
 3. **No "well-actually's."** A 'well-actually' happens when someone says something that's almost (but not entirely) correct, and you say, 'well, actually...' and then give a minor correction. Well-actually's interrupt the discussion and fixate on a minor, usually irrelevant point, often solely to make the person delivering the well-actually feel more important. If you feel the need to correct someone, take a moment to consider whether your correction is in the spirit of truth-seeking, rather than grandstanding, and whether it will provide a positive contribution to the discussion.
 4. Racism, sexism, homophobia, transphobia, ableism, ageism, and other kinds of bias — whether these behaviors are overt or subtle — are not allowed. Subtle -isms can be particularly tricky, as they are often unconscious behaviors we engage in by mistake, and are sometimes caused by conflicting norms between cultures. To use an example, saying "It's so easy my grandmother could do it" is a subtle -ism. If you experience these behaviors during the course, you should feel free to bring it up directly with the person, or if it's more comfortable, point out the behavior to me, another faculty member, or the Office of Counseling and Personal Development. If someone points out that you have engaged in this behavior, it can be tempting to become defensive— but instead, I ask that you apologize, reflect a moment, and move on. If you do not understand why issue was taken with your behavior, it is fine to discuss it with me and/or the class in a respectful, inclusive manner so that everyone can learn from the experience.
- **Learning support and accommodations:** Regis has a general policy for disability accommodation (reproduced below). However, if contacting Disability Services places an undue burden on you, I will do my best to work with you directly and/or work directly with Disability Services – feel free to discuss with me what accommodations will help you succeed in our class. My goal is to make sure everyone has every possible opportunity to succeed, and I'll do my best to make that happen.
 - **Religious observances:** As part of our commitment to inclusion and diversity, I will make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. However, I will be able to better accommodate you the earlier you inform me of the conflict, so please speak to me about your religious obligations as early as possible if our class conflicts with them in any way.

UNIVERSITY-WIDE POLICIES:

The following policies are set at a university level and apply to all of your classes.

Key dates: The add/drop deadline is September 3. The withdrawal deadline is November 10. Midterm grades are due October 17.

Academic Honor Code: All members of the Regis University community exhibit the qualities of honesty, loyalty and trustworthiness in all academic activities, holding themselves and each other accountable for the integrity of the learning community. Regis University students are committed to the highest standards of academic integrity and assume full and complete responsibility for maintaining those standards in the academic environment.

Academic integrity violations: Violations of academic integrity are taken very seriously and include cheating, plagiarism, fabrication, collusion and other forms of academic misconduct. All violations will be reported with appropriate sanctions applied. Sanctions can include, but are not limited to failure of an assignment, failure of a course, removal of academic honors, or review of the Academic Integrity Tutorial. For more serious violations, program suspension, College dismissal or University expulsion may be imposed. Refer to the Regis College Office of the Academic Dean for further information. This Academic Honor Code applies to any student enrolled in a course at Regis University or one of its university partners, regardless of the student's home college or program, and will be enforced according to the policies and procedures outlined in the University Academic Integrity Policy. For the full policy, please see <https://www.regis.edu/About-Regis-University/Policies-and-Procedures/Academic-Integrity-Policies.aspx>

It is the responsibility of each student to review all aspects of the course syllabus and agree to adhere to the Academic Honor Code. In doing so, the student acknowledges that the work represented in all examinations and other assignments is his or her own and that he or she has neither given nor received unauthorized information. Furthermore, the student agrees not to divulge the contents of any examination or assignment to another student in this or ensuing semesters.

Learning Support: If you have a documented disability requiring academic adjustments, please contact Dr. Joie Williams, Director of Disability Services (303-964-3666, mbwillia@regis.edu, Clark Hall 225). She will review your documentation with you and help determine appropriate, reasonable accommodations. Following the meeting with Dr. Williams, please make an appointment with your instructor to discuss your accommodation request in light of the course requirements. You may self-disclose and request academic adjustments at any time during the semester. However, it is strongly recommend that you do so as soon as possible because accommodations are not provided retroactively and adequate lead-time is required.

Counseling: During the semester, if you find that life stressors are interfering with your academic or personal success, consider contacting the Office of Counseling and Personal Development (OCPD). All full-time traditional undergraduate students are eligible for counseling services at no charge. OCPD is located in the Coors Life Direction Center, Room 114 and can be contacted by phone 24/7 at 303-458-3507. For more information, see www.regis.edu/ocpd.

Diversity and Inclusion: At Regis University the term “diversity” affirms our Jesuit commitment to build an inclusive community that values the dignity and contributions of all our members. We strive to shape a learning environment characterized by the Jesuit traditions of mutual respect and the pursuit of social justice, recognizing that our various identities and experiences, including but not limited to age, gender, race/ethnicity, class, disability, sexual orientation, religion and other forms of human difference, contribute to the richness and vitality of our Regis community, and those we are connected to locally, nationally, and globally. In accordance with our Jesuit Catholic mission, we commit ourselves to maintaining a humane atmosphere, where the human rights of every individual are recognized and respected. We desire that same commitment to be instilled in each member of

our community and demonstrated through our words and actions. Should an individual ever feel as though these values are not being upheld in the academic or residential environment, we encourage that person to bring it to the Office of Diversity, Engagement and Inclusion in the Student Center, Suite 219; diverse@regis.edu or 303-964-6211.

Title IX and Regis’s Nondiscrimination and Sexual Misconduct Policy: In the event that you choose to write or speak about having survived sexualized violence, including rape, sexual assault, dating violence, domestic violence, or stalking and specify that this violence occurred while you were a Regis student, federal and state education laws require that, instructors notify the Regis University Title IX Coordinator, Michelle Spradling. She will contact you to let you know about accommodations and support services at Regis and requirements for holding accountable the person who harmed you. To learn more about Title IX, explicitly at Regis, go to <http://www.regis.edu/About-Regis-University/University-Offices-and-Services/Campus-Safety/Title-IX.aspx>

If you do not want the Title IX Coordinator notified, instead of disclosing this information to your instructor, you can speak confidentially with counselors in the Office of Counseling and Personal Development (see below) and the Blue Bench, a community agency that focuses on sexual assault and sponsors a 24/7 hotline. They can connect you with support services and discuss options for holding the perpetrator accountable. The number is 303-322-7273.

Incomplete policy

If unforeseen circumstances occur, and a student is unable to complete the required work for the course, an “Incomplete” grade may be submitted. A request must be made in writing and approved by the instructor. The request will include a timeline and plan for completing the work. The incomplete grade will reflect the grade earned in the course to this point (an “I” with whatever grade earned, including the missing work: an IF or ID or IC) and will only change when the plan is completed. Please see the University Catalog for more of the full policy: “A grade of an Incomplete or “I” denotes that the required work for the course is incomplete due to unforeseen circumstances” (emphasis added), which means “an accident, an illness, a death or major life transaction has occurred.”

QUESTIONS & PROBLEMS: Please don’t hesitate to get in touch with me if you have questions about any aspect of the class or if you start running into difficulties following the material or keeping up with assignments – remember, **I’m here to help! I can’t help you address the problems you’re having if I don’t know that they exist!**

TENTATIVE COURSE SCHEDULE:

A very tentative schedule, subject to change at any time:

Date	Topic	OpenStax	Date	Topic	OpenStax
Monday, August 26,	Expectations		Friday, October 18,	Work	7.1
Wednesday, August 28,	Models, units	1.1-1.2	Monday, October 21,	Kinetic Energy	7.2
Friday, August 30,	Position/vel/scalar/vector	2.1-2.3	Wednesday, October 23,	Potential Energy	7.3-7.5
Monday, September 2,	no class		Friday, October 25,	Conservation of Energy	7.6
Wednesday, September 4,	Acceleration	2.4	Monday, October 28,	thermal physics	13,14,15
Friday, September 6,	Changing Direction	2.4	Wednesday, October 30,	collisions	8.4-8.6
Monday, September 9,	Video Analysis & Modelling	2.5-2.7	Friday, November 1,	2d collisions	8.6
Wednesday, September 11,	Kinematics & Example Problems	2.5-2.8	Monday, November 4,	Uniform Circular Motion	6.1-6.3,6.5
Friday, September 13,	Gravity	3.1-3.5	Wednesday, November 6,	Rotational Kinematics	10.1-10.2
Monday, September 16,	Projectile Motion	3.1-3.5	Friday, November 8,	Rotational Dynamics & Torque	10.3
Wednesday, September 18,	Vectors	3.1-3.5	Monday, November 11,	Rotational Energy	10.4
Friday, September 20,	Force	4.1-4.2	Wednesday, November 13,	Angular Momentum	10.5
Monday, September 23,	Exam 1		Friday, November 15,	Angular Momentum & Torque	10.3-10.5
Wednesday, September 25,	Force & Acceleration	4.1-4.2	Monday, November 18,	Statics	9.1-9.6
Friday, September 27,	Force, Accelartion, Mass, & N2	4.3, 4.5	Wednesday, November 20,	Exam 3	
Monday, September 30,	Newton's 3rd Law	4.4-4.5	Friday, November 22,	Harmonic Motion	16.1-16.6
Wednesday, October 2,	Friction & Free Body Diagrams	4.6, 5.1	Monday, November 25,	Pendulum	16.4
Friday, October 4,	buffer		Wednesday, November 27,	no class	
Monday, October 7,	Momentum	8.1-8.3	Friday, November 29,	no class	
Wednesday, October 9,	Exam 2		Monday, December 2,	relativity, buffer	
Friday, October 11,	no class		Wednesday, December 4,	relativity, buffer	
Monday, October 14,	no class		Friday, December 6,	relativity, buffer	
Wednesday, October 16,	Impulse	8.1-8.3			