

Physics 131-01
General Physics with Calculus I

- Class: MWF 8:20 - 10:20 am, D115
- Professor: Dr. Jerry Gilfoyle; Office: Gottwald Science Center, D110; Phone:289-8255; electronic mail: ggilfoyl@richmond.edu; Office hours: MWF 10:20-11:20 am, T 10:00-11:00 am, T 3:30-4:30 pm. Other times by appointment or availability.
- Objective: To gain an understanding of the ideas of physics and to develop problem solving skills. Physics 131 satisfies the Natural Science Area of Inquiry requirement.
- Textbooks: **Physics for Scientists and Engineers**, 5/e by Knight (recommended) and **Physics For Doing, Part 1** by Belk et al. (required).
- Prerequisites: Calculus I (Math 211). May be taken concurrently.
- Course work: The course is taught in a ‘workshop’ format and consists of lecture, lab, demonstration, and problem solving. Attendance for the entire period is required. This is University policy. No make up work is permitted for unexcused absences. Excessive unexcused absences will have a negative effect on your grades.
- Grading: Grades will be computed on the following basis:

Tests	45%(15% for each of 3 tests)
Quizzes	10%
Lab Notebooks	10%
Lab Summaries	5%
Final exam	30%

Make-up tests, quizzes, and labs will not be administered. If an activity is missed due to an excused absence the next activity will count extra to make up the loss. Unexcused absences will result in a grade of zero. An excused absence is given by the instructor for sufficient reason provided there is adequate warning in a timely fashion. The student is responsible for all missed work. Disability accommodations must be arranged with the instructor at least one week in advance.

- Tests: Tests consist of short-answer questions and problems based on readings, homework, lectures, and lab. Each test is 50 minutes. The final exam is three hours.
- Homework: Homework assignments will consist of readings and problem sets listed on the course webpage. Homework will not be collected, but it is the basis for quizzes and tests so it is utter madness to neglect them. See below for details.
- Laboratory: Lab work includes documenting your work in the ‘activity’ spaces. The entries consist of observations, measurements, calculations, graphs, and answers to questions. You may use the same data and graphs as your partner and discuss concepts with your classmates, but all entries should reflect your own understanding. Each entry should be written in your own words. Lab Summaries should be handed in within 1-2 meetings after completion. Periodically your lab notebook will be handed in and graded for completeness and quality of results.
- Supplies: Pencils and a calculator are required for each meeting. Phones should be silenced and put away.

Physics 131-01 Schedule

Fall 2024

Date	Topic (Chapter)	Date	Topic (Chapter)
Aug 26	1-D Motion (1-2)	Oct 21	Test 2, Momentum (11)
28	1-D Motion (2)	23	Momentum (11)
30	1-D Motion (2)	25	Collisions (11)
Sep 2	Class Day	28	Collisions (11)
4	1-D Motion (2)	30	Collisions (11)
6	1-D Motion (2)	Nov 1	Rotation (12)
9	2-D Motion (2)	4	Rotation (12)
11	2-D Motion (3-4)	6	Angular Momentum (12)
13	2-D Motion (3-4)	8	Angular Momentum (12)
16	2-D Motion (4)	11	Angular Momentum (12)
18	Test 1, Force (4-5)	13	Harmonic Motion (15)
20	Force (4-5)	15	Harmonic Motion (15)
23	Force (5)	18	Harmonic Motion (15)
25	Applications of Force (5-6)	20	Harmonic Motion (15)
27	Gravity (6,13)	22	Test 3, Relativity (36)
30	Gravity (6,13)	25	Relativity (36)
Oct 2	Centripetal Force (8,13)	27	Thanksgiving Break
4	Centripetal Force (8,13)	29	Thanksgiving Break
7	Work and Energy (9-10)	Dec 2	Relativity (36)
9	Work and Energy (9-10)	4	Relativity (36)
11	Work and Energy (9-10)	6	Relativity (36)
14	Fall Break		
16	Work and Energy (9-10)		
18	Momentum (11)		

Final Exam: Friday, Dec 13, 9 am - 12 noon.

The Workshop Physics Approach

Introductory Physics with Calculus is taught in a ‘workshop’ format that emphasizes active learning rather than the passive approach of strictly lecture courses. In a given class meeting, there can be a combination of activities including laboratory work, lecture, discussion, problem solving, and demonstration. During class you will document your activities by filling in entries in the activity space provided in the laboratory units that make up the Investigative Physics Student Guide. The entries consist of observations, predictions, derivations, calculations, and answers to questions. You may use the same data and graphs as your partners and, of course, discuss concepts with your classmates and the instructor. However, your entries in the activity units must reflect your own understanding of the concepts and the meaning of the data and graphs you present. Each entry should be written in your own words. It is important for your success in this course that your entries reflect a sound understanding of the phenomena to observe and analyze. Make-up units will not be permitted and you are responsible for any material that you missed.

The Natural Science Area of Inquiry

Natural science inquiry is designed to enhance students’ appreciation of the beauty of science, develop their understanding of the challenges of doing science, and provide a framework for further inquiry. Students will gain experience in the formulation and testing of hypotheses, thus developing an understanding of questions that are fundamental to science, as well as the process by which hypotheses are developed, evaluated, and interpreted. Students will also learn to engage with the ideas of science and participate in discourse related to the role of the natural sciences in the world today.

Based upon the generation and testing of hypotheses, natural science inquiry is restricted to the study of repeatable, measurable, and verifiable phenomena. Within this area, knowledge may be gained either by controlled experiment or diligent observation, depending upon the phenomena being studied. Similarly, some methodologies rely upon quantitative analysis, while others are primarily qualitative. Given the focus on the process by which scientific knowledge is created and evaluated, courses must include a lab component.

Learning Outcomes:

1. Students will demonstrate knowledge and understanding of content material within the course discipline in the natural sciences.
2. Students will recognize testable hypotheses, demonstrate the ability to formulate good scientific hypotheses, and understand how to design appropriate tests of hypotheses in a field-specific context.
3. Students will gather data via experiment or systematic observation in a laboratory or field setting; they will analyze, interpret, and contextualize these data using discipline-specific tools.
4. Students will assess the reliability of conclusions drawn from scientific data.

Diversity and Inclusion

The University of Richmond is committed to developing a diverse workforce and student body and to modeling an inclusive campus community which values the expression of differences in ways that promote excellence in teaching, learning, personal development and institutional success: **inclusion.richmond.edu**.

Attendance Policy

Students should attend all classes for the full period. Those who are sick should not attend class and should inform the instructor in a timely fashion. Excessive, unexcused absences will be penalized. An excused absence is given by the instructor for sufficient reason provided there is adequate warning in a timely fashion.

- Make-up tests, quizzes, and labs will not be administered. If an activity is missed due to an excused absence the next activity will count extra to make up the loss. Unexcused absences will result in a grade of zero. The student is responsible for all missed work.
- Students must:
 - Notify instructors in advance of the absence if possible.
 - Contact the Student Health Center if sick.
 - Keep up with classwork if they are able to do so.
 - Submit assignments on time whenever possible.
 - Work with their instructors to try to reschedule any missed assignments.
 - Stay in close communication with their instructors.
- This attendance policy puts everyone on their honor. Falsely reporting a reason for an absence is an honor code violation.

Honor Code

This course is taught in accordance with the University of Richmond Honor Code, which can be accessed **here**. For each test and quiz you are required to sign a pledge to neither give nor receive unauthorized assistance during the completion of the work. You can work together on homework and problem sets, but each student must contribute to the group and materials turned in for evaluation must represent your own understanding. You are expected to treat everyone with respect.

Course Webpage

This syllabus and the other course materials can be found on the Phys 131-01 webpage at the following address.

<https://facultystaff.richmond.edu/~ggilfoyl/genphys.html>

You can also find this link on the Blackboard page for Physics 131-01.

Physics 131-01 Homework Assignments

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A VERY effective way to study physics is to do the homework as the material is covered in class and then do additional problems when you study for an exam. See the course website below for the latest updates on assigned homework problems.

<https://facultystaff.richmond.edu/~ggilfoyl/genphys.html>

Electronic copies of the problems are linked to the homework assignment page. Solutions for those assigned problems can also be found on the course website at the appropriate time usually the week after they are assigned. The problems and solutions are password-protected and are solely for the use of students in Physics 131-01 and are not be shared with people outside this class. The solutions, in particular, are not be downloaded, printed, or archived in any way. Sharing, saving, or archiving these solutions are Honor code violations.

The sections on the website refer to the text **Physics for Scientists and Engineers** (5th edition) by Knight. Items labeled with an 'L' refer to the laboratory manual **Physics For Doing** by Belk, Bunn, Fetea, Gilfoyle, Helms, Nebel, Rubin, Serej, Singal, Trawick, and Vineyard.

Help With Physics Homework

If you have trouble with homework help is available from me during my office hours (see page 1 of this syllabus) and at other times when I'm available. The Physics Department is also arranging tutoring sessions. More on that as the schedule develops. The Academic Skills Center (<http://asc.richmond.edu>, 289-8626 or 289-8956) provides several services including tutoring. A list of their services is at the following address along with other information.

<https://facultystaff.richmond.edu/~ggilfoyl/genphys/131/links.html>

A summary of the services at the Academic Skills Center is on the last page of this syllabus.

Physics Laboratory Summaries

After each laboratory you are required to submit a short summary. The purpose of the summary is to keep your work focused on the physics motivation of the lab, list the major results, and to ask questions. Since there will be many questions from the labs on the exams they can be used to prepare for tests. Lab Summaries should be handed in within 1-2 meetings after completion. Periodically your lab notebook will be handed in and graded for completeness and quality of results.

Physics 131-01 Tentative Lab Schedule

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In each meeting there will be laboratory work. During the laboratory you will document your activities by filling in entries in the activity space provided in the laboratory units that make up **Physics For Doing**. The entries consist of observations, predictions, derivations, calculations, and answers to questions. You may use the same data and graphs as your partners and, of course, discuss concepts with your classmates and the instructor. However, your entries in the activity units must reflect your own understanding of the concepts and the meaning of the data and graphs you present. Each entry should be written in your own words. Below is a tentative schedule of labs for the semester. For the latest information on upcoming labs consult the course webpage.

Date	Topic (Lab)	
Aug	26 Pretest, Position vs Time Graphs (1)	
	28 Velocity vs. Time Graphs (2), Relating Position and Velocity Graphs (3)	
	30 Changing Motion (4)	
Sep	2 Slowing Down, Stopping, and Turning Around 1-D Motion (5)	
	4 Measurement, Uncertainty and Variation (6)	
	6 Projectile Motion (7)	
	9 Projectile Motion (7)	
	11 Uniform Circular Motion (8)	
	13 Uniform Circular Motion (8)	
	16 Uniform Circular Motion (8)	
	18 Test 1, Force and Motion I (10)	
	20 Force and Motion I (10), Lab notebooks due	
	23 Newton's Third Law, Tension, and Normal Forces (13)	
	25 Friction and Applying the Laws of Motion (14)	
	27 Friction and Applying the Laws of Motion (14)	
	30 Gravitational and Electromagnetic Forces (15)	
	Oct	2 Centripetal Force (16)
		4 Centripetal Force (16)
7 Work and Power (17)		
9 Work and Kinetic Energy (18)		
11 Work and Kinetic Energy (18)		

- Oct 14 Fall Break
 16 Conservation of Mechanical Energy (19)
 18 Conservation of Mechanical Energy (19)
- 21 Test 2, Momentum and Momentum Change (21)
 23 Impulse, Momentum, and Interactions (22), Lab notebooks due
 25 Impulse, Momentum, and Interactions (22)
- 28 Newton's Laws and Momentum Conservation (23)
 30 Momentum Conservation and Center-of-Mass (24)
- Nov 1 Introduction to Rotation (25)
- 4 Newton's Second Law for Rotation (27)
 6 Newton's Second Law for Rotation (27)
 8 Conservation of Angular Momentum (29)
- 11 Conservation of Angular Momentum (29)
 13 Hooke's Law (30)
 15 Periodic Motion (31)
- 18 Periodic Motion (31), Derivatives of the Sine and Cosine (32)
 20 Thanksgiving Break
 22 Thanksgiving Break
- 25 Periodic Motion (31)
 27 Test 3, Galilean Relativity (34)
 29 Galilean Relativity (34), Lab notebooks due
- Dec 2 The Twins Paradox (35)
 4 The Twins Paradox (35)
 6 The Twins Paradox (35)

Physics 131-01 Themes

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During this semester we will approach physics as a series of problems or themes. Each problem will be introduced and the physics principles needed to solve the problem will be gradually developed until we reach the answer. Some problems can be answered in a few sessions. Others may require longer. The motivation here is to enhance learning by developing the technical ideas in the context of an overall storyline.

Date	Theme	Date	Theme
Aug 26	Quest for Quarks	Oct 21	What killed the dinosaurs?
28	"	23	Test 2, "
30	"	25	"
Sep 2	"	28	"
4	Amazing Basketball Shot	30	Making a Star
6	"	Nov 1	"
9	"	4	"
11	"	6	"
13	Dark Matter??	8	"
16	"	11	Detecting a bio-attack
18	Test 1, Why does Saturn	13	"
20	have rings?	15	"
23	"	18	"
25	"	20	Twin's Paradox
27	"	22	Test 3, Twin's Paradox
30	"	25	Thanksgiving Break
Oct 2	"	27	"
4	Bungee jumping, good idea?	29	"
7	"	Dec 2	Twin's Paradox
9	"	4	"
11	"	6	"
14	What killed the dinosaurs?		
16	"		
18	"		

SYLLABUS INSERT REGARDING ACADEMIC AND PERSONAL SUPPORT SERVICES

Hope N. Walton, Director Academic Skills

Below is a boxed statement that describes the services available from the Weinstein Learning Center and other resources. We recommend that you consider including this boxed statement in your course syllabus, on Blackboard, or perhaps on a separate handout. Of course, other support services that relate specifically to your course can also be added.

Staff members from the resources below are available for consultations about concerns related to students as well as issues related to services.

Weinstein Learning Center

Academic Skills Center (asc.richmond.edu): Academic coaches assist students in assessing and developing their academic and life-skills (e.g., critical reading and thinking, information conceptualization, concentration, test preparation, time management, stress management, etc.). Peer tutors offer assistance in specific subject areas (e.g., calculus, chemistry, accounting, etc.) and will be available for appointments in-person and virtually. Peer tutors are listed on the ASC website. Email [Roger Mancastroppa \(rmancast@richmond.edu\)](mailto:rmancast@richmond.edu) and [Hope Walton \(hwalton@richmond.edu\)](mailto:hwalton@richmond.edu) for coaching appointments in academic and life skills.

English Language Learning assists multi-lingual and international students in honing their language, academic, and/or intercultural skills. Among other available services for students are one-on-one tutoring, group workshops, and semester-long classes on writing and U.S. culture. Please contact Dr. Bohon, Director of English Language Learning, at Leslie.Bohon@Richmond.edu for more information and appointments.

Quantitative Resource Center: (qrc.richmond.edu): Provides services related to quantitative and computational learning across the curriculum through tutoring, consultation and training.

Speech Center: (speech.richmond.edu): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions are offered by teams of trained student consultants. During scheduled [appointments](#), consultants assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations. We look forward to meeting your public speaking needs.

Technology Learning Center: (tlc.richmond.edu): The TLC is a staffed public lab dedicated to supporting digital media projects. Services include camera checkout, video/audio recording assistance, virtual reality, poster printing, 3D printing and modeling. The TLC is located on the second floor of Boatwright Library.

Writing Center (writing.richmond.edu): Assists writers at all levels of experience, across all majors. Students can attend [walk-in hours](#) at Boatwright Library (room 171A) with trained writing consultants who offer friendly critiques of written work.

Other Campus Services

Boatwright Library Research Librarians: (library.richmond.edu/help/ask/ or 289-8876): Research librarians help students with all steps of their research, from identifying or narrowing a topic, to locating, accessing, evaluating, and citing information resources. Librarians support students in their classes across the curriculum and provide individual appointments, class library instruction, tutorials, and [research guides](#) (libguides.richmond.edu). Students can [contact an individual librarian](#) (library.richmond.edu/help/liaison-librarians.html) or ASK a librarian for help via email (library@richmond.edu), text (804-277-9ASK), or [chat](#) (library.richmond.edu/chat.html).

Career Services: (careerservices.richmond.edu or 289-8547): Can assist you in exploring your interests and abilities, choosing a major or course of study, connecting with internships and jobs, and investigating graduate and professional school options. We encourage you to update your profile in [Handshake](#) and schedule an appointment with a career advisor early in your time at UR.

Counseling and Psychological Services: (caps.richmond.edu or 289-8119): Assists currently enrolled, full-time, degree-seeking students in improving their mental health and well-being, and in handling challenges that may impede their growth and development. Services include brief consultations, short-term counseling, skills-building classes, therapy groups, crisis intervention, psychiatric consultation, and related services.