

PHYS 121
Introductory Physics I
Dr. Eric C. Anderson
UMBC•Spring•2025
Syllabus

•Getting ready•

Prerequisites•You must have completed Math 151, or be enrolled in it this semester.

Workload•Experience shows that success requires 8-12 hours per week of intensive effort outside of scheduled class time, consistent with the usual higher education expectation of 2-3 hours outside of class for each credit hour.

Materials•

(1) Pencils or pens and paper, or tablet/ipad with note-taking software like *Notability*.

(2) *Achieve* access. To register for *Achieve*, go to Blackboard, and click on *Achieve prelecture/bridge* tab at left. If asked, follow prompts to enter your first name, last name, and email, and click submit. *Achieve* access is provided through CMI (Course Materials Initiative).

(3) Supplemental text (*Physics for Scientists and Engineers*, by Tipler). Access through Blackboard: Under *Content*, click on *Start Here*, then *MyTextbooks and Course Resources*, and finally *Physics for Scientists and Engineers, Extended Version, 2020 Media Update*. Access is provided through CMI (Course Materials Initiative).

Staying in touch•Check Blackboard announcements DAILY for clarifications, updates, and advice.

Class• *Section 01* MWF 9-9:50 AM in Meyerhoff Chemistry 030
Section 10 MWF 11-11:50 AM in Physics 101

Discussion•Check your schedule for your weekly discussion meeting (beginning *first* week of semester). Here are your graduate teaching assistants (TAs) and undergraduate learning assistants (LAs) who will lead your meetings:

Section	Location	Day and time	TA	LA
02	Interdisciplinary Life S 201	W 7:00-8:50 PM		
03	Interdisciplinary Life S 201	Th 2:30-4:20 PM		
04	Interdisciplinary Life S 201	Th 12:30-2:20 PM		
05	Interdisciplinary Life S 201	Th 4:30-6:20 PM		
06	Interdisciplinary Life S 201	W 5:00-6:50 PM		
07	Interdisciplinary Life S 201	Th 8:00-9:50 AM		
08	Interdisciplinary Life S 230	Th 2:30-4:20 PM		
09	Interdisciplinary Life S 230	Th 6:30-8:20 PM		
11	Interdisciplinary Life S 230	W 7:00-8:50 PM		
12	Interdisciplinary Life S 230	Th 12:30-2:20 PM		
13	Interdisciplinary Life S 230	Th 4:30-6:20 PM		
H-02	Interdisciplinary Life S 301	W 1:00-2:50 PM		

Contact info●

TAs:

Cassie D. (cdaniel3@umbc.edu)
Idris A. (fh46730@umbc.edu)
Arthur M. (arthurm1@umbc.edu)
Arijit B. (arijitb1@umbc.edu)

Instructor: Eric Anderson (andersoe@umbc.edu)

Learning goals●

General education program (GEP) goals: *This course addresses the GEP's Functional Competency Scientific and Quantitative Reasoning. It has been approved to meet the GEP Sciences distribution requirement. Assessment is through elements of select free-response exam items, which require achievement of this Functional Competency.*

- Understand and use mathematical and scientific methods of inquiry, reasoning, processes, and strategies to investigate and solve problems.
- Organize, interpret, draw inferences, and make predictions about natural or behavioral phenomena using mathematical and scientific models and theories.
- Recognize the ethical and social implications of scientific inquiry and technological change and distinguish science from non-science and pseudoscience.
- Recognize that mathematical, statistical, and scientific evidence requires evaluation.

Course-level goals:

- Solve 1-dimension and 2-dimension kinematics motion problems
- Apply Newton's laws to solve problems related to motion and force
- Apply energy principle to solve mechanics problems
- Apply conservation of momentum to solve problems related to collision
- Apply Newton's 2nd law for rotation to solve rotational dynamics problems
- Solve problems related to static equilibrium
- Apply conservation of angular momentum to solve problems
- Apply Newton's laws and energy principle to solve problems related to simple harmonic motion

Assessment is through responses to select exam items, which require achievement of these course level goals.

Find more detailed learning goals for each unit in Blackboard under *Start Here* tab.

●Methods●

Achieve prelectures and bridges● **Access through Blackboard (Achieve prelecture/bridge tab at left.)** Respond to prelecture questions and bridge questions (multiple-choice items checking your understanding.) Due most class days at 8:50 AM (see day-by-day guide at the end of syllabus). Earn 80% of possible points for full credit.

Wise counsel: It pays to spend the WHOLE 20 or 25 minutes viewing the prelecture for a unit. Most of your learning will come with practice *applying* the material later (in class, discussion, and homework), but the prelectures provide an essential foundation.

Class and class participation● Class is designed to afford you opportunities to deepen your conceptual understanding and begin to develop your problem-solving skills. Expect a mix: Sit and listen as I present a concept or model a strategy, engage with your neighbors over a question that I pose, then we'll follow up together.

Life hack: Find the pdf lecture outline the evening before each class on BB under *Class materials*. Print it out and take notes or annotate it on your tablet; don't spend our time together writing down what's projected on the screen. Listen, think, discuss. Don't forget your notebook and pencil or tablet!

Discussion • Designed to help you develop and refine your problem-solving skills with the help of your group, your TA, and your LAs. Show up with a pencil. Laptop can sometimes be useful to access simulations, etc. You'll work on and submit a written discussion packet each week, graded on a 7-point basis:

Contribution to group effort:

- 3 Attended full session, engaged in group effort all or most of session
- 2 Attended majority of session, and participated with group majority of session
- 1 Missed more than half of session, or disengaged with group most of session
- 0 Missed all or most of session

Quality of written responses:

- 3 Applies appropriate concepts and frameworks (as presented in prelecture and class) most of the time, and carries out valid analyses the majority of the time, and *quantity** satisfactory (got at least as far as the majority of groups)
- 2 Applies appropriate concepts and frameworks the majority of the time, carries out valid analyses some of the time, and *quantity* adequate (at least close to the majority of groups)
- 1 Rarely applies appropriate concepts and frameworks, or rarely carries out valid analyses, or quantity lacking (attempts far less than most groups)
- 0 Mostly missing or mostly incorrect approaches

**In general, groups are not expected to plow through a discussion packet to the end within the 1 hr 50 min time frame for discussion. We try to provide enough material to challenge even the most resolute groups. Focus on quality: work together to practice applying appropriate concepts and frameworks presented in prelecture and class, and take the time to make sure all group members are on board. Items near the end of the packet are there for you if you're ready: for reinforcement and more advanced practice.*

Complete and correct solution to selected item

- 1 Complete and correct response
- 0.5 Some missing or incorrect analysis
- 0 Blank, or unsuitable approach

Best 12 of 14 count. You must attend discussion to submit. Solutions posted on Blackboard under *Discussion materials* tab each Thursday at 8:30 PM.

How to prepare for discussion? Simple: Keep up with Achieve and class, so that you're ready to practice applying what you've begun to learn.

Achieve homework (HW)•Access through Blackboard (*Achieve homework tab at left.*) HW assignments are designed to build conceptual understanding and problem-solving skills through systematic practice and feedback. Due Tuesdays and some Thursdays at midnight. You're allowed 5 attempts for each numerical item. Your response should be within 1% of the correct answer, so enter at least three significant figures, and don't round any intermediate results. Earn 80% of possible points for full credit. HW assignments offer additional deadlines (up to 24 hrs late for 90% credit; 24-48 hrs late for 80% credit.) Keep a careful written record of your work for future studying.

Pro tips: Use Achieve prelecture examples, the supplemental text, collaborate with classmates, come to Physics Tutorial Center or SI PASS sessions for help. Searching for solutions online is less productive; you may manage to get the HW points with minimal effort, but miss the larger goal of mastering the material for the exams. Have the equation sheet (under the Start Here tab) at hand.

Exams•6 exams. Expect multiple-choice and other objective items (some qualitative and some quantitative), and a few bigger free-response problems affording significant partial credit. Equation sheet provided (see the Blackboard tab *Start here.*) Calculator allowed. *Given at 8 AM, in multiple lecture halls; check Blackboard/Exam seating charts for your assigned lecture hall and seat.*

Exam redemption•Your lowest exam score may be increased at the end of the semester. If you score higher on the Final Exam than your lowest exam, I'll replace your lowest exam score with the average of your original score on your lowest exam and your Final Exam score. Example: Your lowest exam score is 55%, and your Final Exam score is 85%. That 55% is replaced with 70%.

Final exam•Similar to exams, comprehensive.

•Policies•

Grading•5% for *Achieve* prelectures/bridges, 10% for *Achieve* homework, 10% for discussion, 10% for each of 6 exams, 15% for final exam. 89.5% required for A, 79.5% for B, 69.5% for C, and 59.5% for D.

Reclaiming and reviewing work•Exams and discussion packets are returned to you at the end of your discussion following the exam. Later, they will be available any time during my PTC hours. Exam solutions are posted on Blackboard at 5 PM after each exam. Please review graded work right away, and check that we enter your grades correctly. *Notify us of any grading mistakes within a week:* Contact your discussion TA about discussion grade mistakes. Get exams to me directly, or through the Physics Department office (Physics 221), along with a note describing the mistake. (For errors in assigning partial credit, make sure that you've examined the posted solutions and the grading sheet, and that your note explicitly addresses the discrepancy. Your entire exam will be regraded.)

Late and missed work•It's expected that technical difficulties, illness, attention to family matters and the like may get in the way of completing your work from time to time. Therefore earning 80% of possible points on *Achieve* prelectures/bridges and *Achieve* HW will get you full credit. Examples: You earn 84% of possible HW points? That becomes 100%. You earn 71% of possible HW points? That becomes $(71/80)*100\% = 89\%$. In addition, completing *Achieve* HW up to 24 hrs late gets you 90% of possible points, and up to 48 hrs late 80% of possible points. Your lowest two discussion grades will be dropped. If you must miss an exam due to officially sanctioned UMBC activities, illness, family emergency, detention by authorities, or similar difficulty, contact me as soon as possible. With written verification of the cause of your absence, I'll arrange a makeup over the same material. Do let me know as soon as you can of any documented extended illness or family responsibilities that may impact your ability to keep up in the class, and we'll try to make a plan to keep you on track to succeed.

Academic integrity•By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal, and will be addressed according to the UMBC Policy on Academic Integrity (<https://www.umbc.edu/policies/pdfs/UMBC%20III%201.10.03%20Undergraduate%20Student%20Academic%20Conduct%20Policy.pdf>) Examples include attempting to make use of disallowed materials on exams, attempting to communicate with anyone other than the instructor or TA during an exam, altering graded work and submitting it for regrading, asking someone else to take an exam in your place, copying another's work on homework, asking someone else to do homework and representing it as your own, and permitting or assisting another student to carry out any of the above. Penalties range from a grade of 0 on a homework or exam to an F in the course (at my discretion), and from denotation of academic misconduct on the transcript to expulsion (as determined by official hearing of the Academic Conduct Committee.)

•Getting help•

Monitor your performance•The best indicator of your current grade in the course is the "weighted total" that may be found in Blackboard in *MyGrades*. Lowest discussion grades will be dropped late in the semester.

Drop by the Physics Tutorial Center (PTC)•For help with homework, exam preparation, and other questions. Staffed by instructors and graduate TAs. Location: Physics building room 226A. Hours: 12 – 5 PM Monday through Thursday until Tues 13 May. My own hours in the PTC are **Mondays 12 – 1 PM, Tuesdays 12 – 1 PM, and Thursdays 12 – 2 PM.**

BB discussion board•Post a physics question to a forum on Blackboard, or post a reply to another's question.

Try practice exams•Past exams provided on blackboard under *Exam practice* along with solutions. Best to print out and try to replicate exam conditions (only calculator and equation sheet, 50 min time limit.) Consult solutions only after a solid effort on your own.

Supplemental Instruction Peer assisted study sessions (SI PASS)•A successful peer from a recent semester leads twice-weekly study sessions. More info to come on Blackboard.

UMBC's Academic Success Center (ASC) •Provides a range of resources to support students as they progress toward degree completion. The ASC has created a specialized set of [Online Learning Resources](#). In addition, check out the following resources:

- [Academic Success Center Resources](#) include: Online tutoring and writing support, supplemental instruction peer-assisted study sessions ([SI PASS](#)), placement testing, FYI academic alerts, success courses, academic advocacy, academic policy and academic success meetings.
- [Tutoring and Writing Center Appointments](#)
- [Academic Advocates](#): Advocates work one-on-one with students who need support navigating academic and institutional challenges, no matter how complex the concerns (i.e., personal, academic, or financial).
- [Academic Success Meetings](#) - Schedule a one-to-one virtual meeting with an Academic Success Center Professional who can help you with time management, study skills, and accessing campus resources.

If you have a question, please contact the ASC at academicsuccess@umbc.edu

Technology Support Center•Offers help with technology-related concerns.

Something else?•Please email me (andersoe@umbc.edu) and I'll try to help. (For physics-related questions, stick with the BB Discussion Board so others may benefit.)

●University policies and resources●

Accessibility and Disability Accommodations, Guidance and Resources●

Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that creates equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at sds.umbc.edu for registration information and office procedures.

SDS email: disAbility@umbc.edu

SDS phone: [410-455-2459](tel:410-455-2459)

If you will be using SDS approved accommodations in this class, please contact the instructor to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination●

[UMBC Policy](#) in addition to federal and state law (to include Title IX) prohibits discrimination and harassment on the basis of sex, sexual orientation, and gender identity in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment, or related retaliation should contact the University's Title IX Coordinator to make a report and/or access support and resources. The Title IX Coordinator can be reached at titleixcoordinator@umbc.edu or 410-455-1717.

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in making a report, please use the [Online Reporting/Referral Form](#). Please note that, if you report anonymously, the University's ability to respond will be limited.

Notice that Faculty and Teaching Assistants are Responsible Employees with Mandatory Reporting Obligations

All faculty members and teaching assistants are considered Responsible Employees, per UMBC's [Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination](#). Faculty and teaching assistants therefore required to report all known information regarding alleged conduct that may be a violation of the Policy to the Title IX Coordinator, even if a student discloses an experience that occurred before attending UMBC and/or an incident that only involves people not affiliated with UMBC. Reports are required regardless of the amount of detail provided and even in instances where support has already been offered or received.

While faculty members want to encourage you to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report past and present sexual harassment, sexual assault, domestic and dating violence, stalking, and gender discrimination that is shared with them to the Title IX Coordinator so that the University can inform students of their [rights, resources, and support](#). While you are encouraged to do so, you are not obligated to respond to outreach conducted as a result of a report to the Title IX Coordinator.

If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of [Confidential Resources](#) available to support you:

[Retriever Integrated Health](#) (Main Campus): 410-455-2472; Monday – Friday 8:30 a.m. – 5 p.m.; For After-Hours Support, Call 988.

[Center for Counseling and Well-Being](#) (Shady Grove Campus): 301-738-6273; Monday-Thursday 10:00a.m. – 7:00 p.m. and Friday 10:00 a.m. – 2:00 p.m. (virtual) [Online Appointment Request Form](#)

Pastoral Counseling via [The Gathering Space for Spiritual Well-Being](#): 410-455-6795; i3b@umbc.edu; Monday – Friday 8:00 a.m. – 10:00 p.m.

Other Resources

[Women’s Center](#) (open to students of all genders): [410-455-2714](tel:410-455-2714); womenscenter@umbc.edu; Monday – Thursday 9:30 a.m. – 5:00 p.m. and Friday 10:00 a.m. – 4 p.m.

[Shady Grove Student Resources](#), [Maryland Resources](#), [National Resources](#).

[Child Abuse and Neglect](#)

Please note that Maryland law and [UMBC policy](#) require that faculty report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police even if the person who experienced the abuse or neglect is now over 18.

[Pregnant and Parenting Students](#)●

UMBC’s [Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination](#) expressly prohibits all forms of discrimination and harassment on the basis of sex, including pregnancy. Resources for pregnant, parenting and breastfeeding students are available through the University’s [Office of Equity and Civil Rights](#). Pregnant and parenting students are encouraged to contact the Title IX Coordinator to discuss plans and ensure ongoing access to their academic program with respect to a leave of absence – returning following leave, or any other accommodation that may be needed related to pregnancy, childbirth, adoption, breastfeeding, and/or the early months of parenting.

In addition, students who are pregnant and have an impairment related to their pregnancy that qualifies as disability under the ADA may be entitled to accommodations through the [Office of Student Disability Services](#).

Religious Observances & Accommodations●

UMBC [Policy](#) provides that students should not be penalized because of observances of their religious beliefs, and that students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences or requested modifications for religious observances in advance, and as early as possible. For questions or guidance regarding religious observances and accommodations, please contact the Office of Equity and Civil Rights at ecr@umbc.edu.

Hate, Bias, Discrimination and Harassment

UMBC values safety, cultural and ethnic diversity, social responsibility, lifelong learning, equity, and civic engagement.

Consistent with these principles, [UMBC Policy](#) prohibits discrimination and harassment in its educational programs and activities or with respect to employment terms and conditions based on race, creed, color, religion, sex, gender, pregnancy, ancestry, age, gender identity or expression, national origin, veterans status, marital status, sexual orientation, physical or mental disability, or genetic information.

Students (and faculty and staff) who experience discrimination, harassment, hate, or bias based upon a protected status or who have such matters reported to them should use the [online reporting/referral form](#) to report discrimination, hate, or bias incidents. You may report incidents that happen to you anonymously. Please note that, if you report anonymously, the University’s ability to respond may be limited.

●Day-by-day guide●

Achieve prelecture/bridges, *Achieve Homework (HW)*, Discussion,
Exams, Supplemental source: (Tipler), **No meetings**

Week of:	Monday	Wednesday	Discussion (Wed or Thur)	Friday
27-31 Jan	<p>***Special***</p> <p>Blackboard syllabus quiz due Monday 8:50 AM</p> <p>***Special***</p> <p>Welcome to the course</p>	<p><u>Motion</u></p> <p>Unit 1 One-dimensional kinematics (1.3-4, 2.1-4)</p>	Unit 1	Unit 1 One-dimensional kinematics (continued)
3-7 Feb	<p>Unit 2 Vectors and two-dimensional kinematics (1.6-7, 3.1-2)</p> <p>Unit 1 HW (due Tues midnight)</p>	<p>Unit 2 Vectors and two-dimensional kinematics (continued)</p> <p>Unit 2 HW (due Thurs midnight)</p>	Unit 2	Unit 3 Relative and circular motion (3.1, 3)
10-14 Feb	<p><u>Force</u></p> <p>Unit 4 Newton's Laws (4.1-5,7)</p> <p>Unit 3 HW (due Tues midnight)</p>	Unit 4 Newton's Laws (continued)	Unit 3	Exam 1 Motion (Units 1-3) 8 AM No class
17-21 Feb	<p>Unit 5 Forces and free-body diagrams (4.6,8, 5.3)</p> <p>Unit 4 HW (due Tues midnight)</p>	Unit 5 Forces and free-body diagrams (continued)	Units 4-5	Unit 5 Forces and free-body diagrams (continued)
24-28 Feb	<p>Unit 6 Friction and buoyancy (5.1)</p> <p>Unit 5 HW (due Tues midnight)</p>	Unit 6 Friction and buoyancy (continued)	Unit 6	Unit 6 Friction and buoyancy (continued)

3-7 Mar	<u>Energy</u> Unit 7 Work and kinetic energy (6.1-4, 11.2-3) Unit 6 HW (due Tues midnight)	Unit 8 Conservative forces and potential energy (7.1-3, 11.2-3)	Units 7-8	Exam 2 Force (Units 4-6) 8 AM No class
10-14 Mar	Unit 8 Conservative forces and potential energy (continued) Unit 7 HW (due Tues midnight)	Unit 9 Work and potential energy II (7.1-3, 11.2-3) Unit 8 HW (due Thurs midnight)	Unit 9	Unit 9 Work and potential energy II (continued)
17-21 Mar				
24-28 Mar	<u>Momentum</u> Unit 10 Center of mass (5.5, 6.5) Unit 9 HW (due Tues midnight)	Unit 11 Conservation of momentum (8.1,3)	Units 10-11	Exam 3 Energy (Units 7-9) 8 AM No class
31 Mar-4 Apr	Unit 12 Elastic collisions (8.3-4) Units 10-11 HW (due Tues midnight)	Unit 13 Collisions, impulse, and reference frames (8.2-3) Unit 12 HW (due Thurs midnight)	Units 12-13	Unit 13 Collisions, impulse, and reference frames (continued)
7-11 Apr	<u>Rotation</u> Unit 14 Rotational kinematics and moment of inertia (9.1-3) Unit 13 HW (due Tues midnight)	Unit 15 Parallel axis theorem and torque (9.3-4)	Unit 14-15	Exam 4 Momentum (Units 10-13) 8 AM No class
14-18 Apr	Unit 16 Rotational dynamics (9.4-6) Unit 14 HW (due Tues midnight)	Unit 16 Rotational dynamics (continued) Unit 15 HW (due Thurs midnight)	Unit 16	Unit 16 Rotational dynamics (continued)

21-25 Apr	<u>Statics</u> Unit 17 Rotational statics (12.1-5) Unit 16 HW (due Tues midnight)	Unit 18 Rotational statics II (12.1-5)	Units 17-18	Exam 5 Rotation (Units 14-16) 8 AM No class
28 Apr - 2 May	Unit 18 Rotational statics II (continued) Unit 17 HW (due Tues midnight)	<u>Angular momentum</u> Unit 19 Angular momentum (10.1-3) Unit 18 HW (due Thurs midnight)	Unit 19	Unit 19 Angular momentum (continued)
5-9 May	<u>Simple harmonic motion</u> Unit 20 Simple harmonic motion (14.1-3) Unit 19 HW (due Tues midnight)	Unit 20 Simple harmonic motion (continued)	Unit 20	Exam 6 Statics and Angular momentum (Units 17-19) 8 AM No class
12-16 May	Unit 20 Simple harmonic motion (continued) Unit 20 HW (due Tues midnight)			Final Exam: Units 1-20 (Date, time, and locations to be determined)