PHYS 122
Introductory Physics II
Dr. Eric C. Anderson
UMBC • Fall • 2016
Syllabus

• Getting ready •

Prerequisites• You must have completed Phys 121, and Math 152 (or be enrolled in it this semester.)

Workload• Experience shows that success requires at least 8-10 hours per week of intensive effort outside of class - more for those lacking strong preparation and study techniques. Be sure that you can dedicate the time and concentration required for success.

The book and other required items• *FlipItPhysics* access by Gary Gladding et al, ISBN: 9781429272438. If you desire a large textbook as an additional resource, the UMBC bookstore also stocks *Physics for Scientists and Engineers* by Tipler; alternatively, any old calculus-based intro physics text may serve the same purpose. RF LCD Clicker + 1 Year Turning Account. Scientific calculator.

Registering for *FlipIt Physics*• See the document *How to register for FlipItPhysics* on Blackboard under Course Documents. The course access key is a12cc22d.

Blackboard (BB)• Access between classes for course materials, discussion forums, your grades, helpful advice, and announcements.

Registering your clicker• See Blackboard/Syllabus folder.

Class• MWF 1-1:50 PM in Engineering 027 and weekly discussion (check your schedule).

• 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.*

1. Understand and use mathematical and scientific methods of inquiry, reasoning, processes, and strategies to investigate and solve problems.
2. Organize, interpret, draw inferences, and make predictions about natural or behavioral phenomena using mathematical and scientific models and theories.
3. Recognize that mathematical, statistical, and scientific evidence requires evaluation.

Prerequisite Knowledge: *Newton's laws and energy principles apply to thermal processes and electric and magnetic interactions.*

1. Use trigonometric relations to find vector components and vector sums graphically and analytically; determine scalar products and vector products.
2. Evaluate and interpret derivatives and integrals of polynomials, trig functions, and inverse functions.
3. Apply Newton's laws and kinematic relationships to infer motion of particles.
4. Apply work and energy principles to particles and systems of particles.

Course goals:

Thermodynamics: The first law of thermodynamics constrains thermal processes based on conservation of energy; the second law of thermodynamics gives the direction of thermal processes.

1. Apply the first law of thermodynamics, ideal gas law, and ideas of molar heat capacity to thermal processes with ideal gases.
2. Analyze the performance of thermodynamic cycles.

Electricity: *Charged particles create electric fields; electric fields exert forces on moving charged particles.*

3. Use Coulomb's law and the principle of superposition to find electric fields of charged particles and determine forces on charged particles.
4. Apply Gauss's law to find electric fields of symmetric charge distributions and infer charge distributions on conductors.

5. Qualitatively and quantitatively reason with electric potential and electric potential energy; determine electric potential difference from electric field.

DC circuits: *Potential difference across a conductor results in electric current.*

6. Apply the definition of capacitance and Kirchoff's rules to find charges and voltages in circuits containing batteries and capacitors.
7. Apply Ohm's law and Kirchoff's rules to find currents, voltages, and power in circuits containing batteries and resistors.
8. Analyze charging and discharging processes in circuits containing batteries, resistors, and capacitors, i.e, determine charges, currents, and voltages as a function of time and in limiting cases of small and large times.

Magnetism: *Electric currents create magnetic fields; magnetic fields exert forces on moving electric charges.*

9. Determine the magnetic force on a moving charged particle and its resulting motion, the magnetic force on a current-carrying wire, and apply ideas of torque and potential energy to current loops in magnetic fields.
10. Apply results of the Biot-Savart law and the superposition principle to determine magnetic fields due to infinite straight wires and current loops.

Faraday's law and Induction: *Changing magnetic flux results in an* emf*.*

11. Apply Faraday's law to determine the *emf* arising from a changing magnetic flux.

• Methods •

Prelectures and checkpoints • Access multimedia learning modules (MLMs) through the *FlipItPhysics* website, generally before each Mon and Wed class. Complete checkpoints – multiple-choice questions checking your understanding of the MLM content - no later than 10 minutes before class.

Lecture • Course content is delivered via MLMs; lectures offer opportunities for you to deepen your understanding by working through questions posed by your instructor independently and with your peers. Find the pdf lecture outline before each class on BB under *Course Documents*. Print it out and take notes or annotate it on your tablet. Bring your clicker to each class. Your clicker grade is based on the number of days in which you respond to clicker questions – never on getting the right answers.

Discussion • Expect collaborative problem solving practice and feedback in your weekly discussion session. Your TA will collect your work on discussion problems at the end of each session. Grading is based on both completeness/effort, and correctness (one randomly selected item.)

Homework • HW assignments are designed to build conceptual understanding, develop scientific reasoning skills, and provide practice and feedback with systematic problem solving. Due (online, through *FlipItPhysics*) most Tuesdays and Thursdays at midnight. Keep a careful written record of your work for future studying.

Exams and quizzes • Given most Fridays, quizzes provide practice and feedback for exam preparation. 3 class exams and a comprehensive final. Expect to solve problems and respond to conceptual multiple-choice items. Needed quantitative relationships will be provided (see BB/*Course Documents*). Calculator allowed. *Class exams given at 8 AM, in multiple lecture halls; check BB for your assigned lecture hall and seat.*

• Policies •

Grading • 5% (20 pts) for prelectures/checkpoints, 5% (20 pts) for best 8 of 12 quizzes, 5% (20 pts) for homework, 5% (20 pts) for clickers, 5% (20 pts) for best 10 of 14 discussion grades, 15% (60 pts) for each of 3 exams, 30% (120 pts) for final exam. 360 pts (out of 400 possible) required for A, 320 pts for B, 280 pts for C, and 240 pts for D.

Reclaiming and reviewing work • Exams, quizzes, and discussion materials are returned to you in discussion. Exam solutions are posted in BB/*Course Documents* at 5 PM after each exam. Please review graded work right away, and check that we enter your grades in BB 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 scheme revealed therein, and that your note explicitly addresses the discrepancy. Your entire exam will be regraded.)

Making up work• If you must miss an exam due to officially sanctioned UMBC activities, illness, family emergency, detention by authorities, or another difficulty, contact me as soon as possible. At my discretion, I'll request written verification of the cause of your absence and arrange a makeup over the same material. No quiz or discussion makeups; we drop grades to allow for illness and other difficulties. No late prelectures/checkpoints; get an early start in case of technical or other difficulties. FlipItPhysics homework may be completed up to a week late for 80% credit. Your participation grade allows 5 free days to account for absences for any reason and clicker malfunctions. No individual accommodations are possible.

Academic integrity• All instances of academic misconduct will be addressed according to the UMBC Policy on Academic Integrity (http://www.umbc.edu/integrity/students.html). Examples include attempting to make use of disallowed materials on quizzes and 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.)

Courtesy• Electronic devices in class only to assist with learning physics please (e.g., viewing/annotating class materials, researching)

•Getting help•

Contact me• Eric C. Anderson, Physics 320. Office hours M 2:00-2:50, W 2:00-2:50, Th 12:30-1:50 through 13 Dec. (Check BB for updates.) Phone 455-5823, email andersoe@umbc.edu. Please email me through BB or use your UMBC email and give your full name and your class. *If you seek HW help or have a general course question, please post to the appropriate discussion forum on Blackboard, so that others might benefit*.

Form or join a study group• Perhaps with the help of the *Forming study groups* forum on BB.

Attend PASS sessions• A successful peer from last semester leads weekly study sessions and exam reviews; more info to follow on BB.

Troll the discussion board• Post a question to a forum on Blackboard, or post an answer to another's question.

Attend the help sessions (HS)• Offered before each class exam (see day-by-day guide below).

Contact the Learning Resource Center (LRC)• At http://www.umbc.edu/lrc/ or 455-2444 and inquire about small group tutoring.

• Day-by-day guide •

Week of:	Monday	Discussion	Wednesday	Friday
29 Aug-2 Sep			Introduction to the course	*Thermodynamics* Unit 1 Introduction to thermodynamics
5-9 Sep			Unit 2 Heat and temperature	Review
12-16 Sep	Unit 3 Ideal gas	Ideal gases and calorimetry	Unit 4 Equipartition, heat capacity, and conduction	Review Quiz 1 (Ch 1 and 2)
19-24 Sep	Unit 5 Heat engines	Equipartition	Unit 6 Reversible processes	Review Quiz 2 (Ch 3 and 4)
26-30 Sep	*Electricity* Unit 7 Coulomb's law	Heat engines, Mechanics review	Unit 8 Electric fields	Review Quiz 3 (Ch 5 and 6) Help session 12-12:50 in Eng 027
3-7 Oct	**Exam 1 (*Thermodynamics,* 8 AM in assigned room and seat; see BB)** Review	Coulomb's law	Unit 9 Electric flux and field lines	Review Quiz 4 (Ch 7 and 8)
10-14 Oct	Unit 10 Gauss' law	Gauss's law	Unit 11 Electric potential energy	Review Quiz 5 (Ch 9)
17-21 Oct	Unit 12 Electric potential	Electric potential	Unit 13 Conductors and capacitance	Review Quiz 6 (Ch 10 and 11)
24-28 Oct	*DC Circuits* Unit 14 Capacitors	Capacitors	Unit 15 Electric current	Review Quiz 7 (Ch 12 and 13) Help session 12-12:50 in Eng 027

31 Oct-4 Nov	**Exam 2 (*Electricity*, 8 AM in assigned room and seat; see BB)** Review	Kirchoff's rules	Unit 16 Kirchoff's rules	Review Quiz 8 (Ch 14 and 15)
7-11 Nov	Unit 17 RC circuits	RC circuits	*Magnetism* Unit 18 Magnetism	Review Quiz 9 (Ch 16)
14-18 Nov	Unit 19 Forces and torques on currents	Magnetic force and torque	Unit 20 Biot Savart law	Review Quiz 10 (Ch 17 and 18)
21-25 Nov	Unit 21 Ampere's law	Biot-Savart law and Ampere's law	*Faraday's law and Inductors* Unit 22 Motional emf	
28 Nov-2 Dec	Unit 23 Faraday's law	Faraday's law	Review Help session 12-12:50 in ITE 102	Unit 24 Induction and RL circuits Quiz 11 (Ch 21)
5-9 Dec	**Exam 3 (*DC circuits and Magnetism*, 8 AM in assigned room and seat; see BB)** Review	Inductors and RL circuits	Unit 25 LC and RLC circuits	Review Quiz 12 (Ch 23 and 24)
12-16 Dec	Review	Conceptual inventory (ungraded, attendance required)		**Final exam (Comprehensive: *Electricity, DC circuits, Magnetism,* extra weight to *Faraday's law and Inductors)* 6-8 PM Tues 20 Dec in assigned room and seat; see BB)**