

**PHYS 122**  
**Introductory Physics II**  
**Dr. Eric C. Anderson**  
**UMBC • Spring • 2019**  
**Syllabus**

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**• 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.

**Blackboard (BB)** • For access to course materials, discussion forums, your grades, helpful advice, and announcements. Log in at least once between classes.

**The book and other required items** • Principal source: *FlipItPhysics* by Gary Gladding et al, ISBN: 9781429272438. Course access key: 79d40e70. Supplemental source: *Physics for Scientists and Engineers* by Tipler. RF LCD Clicker + Turning Account (from the bookstore). Scientific calculator.

**Enrolling in *FlipIt Physics*** • Provided through Course Materials Initiative (CMI). In Blackboard, click on *Start here* and use the course access key and payment code found there.

**Accessing supplemental source (Tipler)** • Provided through CMI. In Blackboard, click on *Start here/Physics for Scientists and Engineers*.

**Registering your clicker** • In Blackboard click on *Start here/Registering your clicker*.

**Class** • MWF 11-11:50 PM in Engineering 027 and weekly discussion (check your schedule).

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**• 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.*

- 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 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.*

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

**Course goals:**

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

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

- Apply the definition of capacitance and Kirchoff's rules to find charges and voltages in circuits containing batteries and capacitors.
- Apply Ohm's law and Kirchoff's rules to find currents, voltages, and power in circuits containing batteries and resistors.
- 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 charged particles.*

- 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.
- 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 Inductors:** *Changing magnetic fields make electric currents.*

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

**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.*

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

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## • 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. Earn 80% of possible points for full credit.

**Lecture**• Course content is delivered via MLMs; lectures offer opportunities for you to deepen your conceptual understanding by working through questions posed by your instructor independently and with your peers. Find the pdf lecture outline the evening before each class on BB under *Course Documents*. ***Print it out and take notes or annotate it on your tablet; otherwise you'll waste much of our time together writing down what's projected on the screen instead of thinking and discussing.*** Bring your clicker to each class. For some clicker questions, you'll be awarded a full point for simply responding. For others, it's half a point for responding and half a point for getting it right.

**Discussion**• Expect collaborative problem solving practice and frequent feedback from TAs and undergraduate learning assistants in your weekly discussion session. Your TA will collect your work on the discussion packet at the end of each session. Grading is based on both completeness/effort, and correctness (one randomly selected page.)

**Homework**• HW assignments are designed to build conceptual understanding and problem solving skills through systematic practice and feedback. Due (online, through *FlipItPhysics*) most Tuesdays and Thursdays at midnight. Earn 80% of possible points for full credit. *FlipIt* sometimes offers additional feedback after the deadline. HW assignments offer a second deadline a week later for 80% credit. Keep a careful written record of your work for future studying.

**Exams and quizzes**• Given each Friday, quizzes provide practice and feedback for exam preparation. 3 class exams and a comprehensive final. Expect to solve problems and respond to 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.*

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## •Policies•

**Grading**•5% for prelectures/checkpoints, 7.5% for homework, 7.5% for best 13 of 14 discussion grades, 5% for clickers, 12.5% for best 13 of 14 quizzes, 12.5% for each of 3 exams, 25% 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, 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. The final exam must be taken at the scheduled time. 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)

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## •Getting help•

**Contact me**•Eric C. Anderson, Physics 320. Office hours MW 12:00-12:50, Th 1:00-1:50 in Phys 226A through 15 May. (Check BB for updates.) Phone 455-5823, email [andersoe@umbc.edu](mailto: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.

**Drop by the Physics Tutorial Center**•Physics 226, open 12-5 Monday through Thursday. Staffed by instructors and graduate TAs.

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

**Technology Support Center**•Offers help with technical concerns with clickers, etc. <https://doit.umbc.edu/tsc/>

### **Contact the Learning Resource Center (LRC)•**

1) Math and Science Learning Center: free tutoring for Math, Statistics, Science, and Economics classes. No appointment needed. The Math and Science Learning Center is a great place to study and get answers to questions. The Math and Science Learning Center is located on the first floor of the A.O.K. Library, behind the reference desk. To check the schedule of available tutors visit <https://lrc.umbc.edu/tutor/math-lab/>

2) Appointment Tutoring: free tutoring, by appointment, for selected classes, in small groups. These are more in-depth, ongoing weekly tutoring sessions. Tutoring sessions take place in the LRC (Sherman Hall 345). To find a tutor visit <https://lrc.umbc.edu/tutor/>  
*Who are peer tutors?* Peer tutors are currently enrolled students with demonstrated course mastery who receive ongoing training. Peer tutors have undergone a selection process that includes faculty recommendations. *What happens during a tutoring session?* Peer tutors help students learn course concepts and methods of analysis, practice problems, and prepare for tests; they also help with learning strategies and study skills for the classes they support.

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**Student Disability Services (SDS)•** UMBC is committed to eliminating discriminatory obstacles that may disadvantage students based on disability. Services for students with disabilities are provided for all students qualified under the Americans with Disabilities Act (ADA) of 1990, the ADAAA of 2009, 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 would allow for students to have equal access and inclusion in all courses, programs, and activities at the University. If you have a documented disability and would like to request academic accommodations, please refer to the SDS website at [sds.umbc.edu](https://sds.umbc.edu) for registration information and to begin the process, or alternatively you may visit the SDS office in person in the Math/Psychology Building, Room 212. For any questions or concerns, you may contact us through email at [disAbility@umbc.edu](mailto:disAbility@umbc.edu) or phone at (410) 455-2459. If you require accommodations for this class, please visit me during office hours to discuss your SDS-approved accommodations.

## •Day-by-day guide•

Principal source: **FlipIt Physics**. Supplemental source: (Tipler)

Week of:	Monday	Discussion	Wednesday	Friday
28 Jan-1 Feb	<u>Electricity</u>  <b>Unit 1</b> Coulomb's law (21.1-3)	Coulomb's law	<b>Unit 2</b> Electric fields (21.4-6, 22.1)	Review  Quiz 1 (Unit 1)
4-8 Feb	<b>Unit 3</b> Electric flux and field lines (22.2)	Electric flux and Gauss's law	<b>Unit 4</b> Gauss' law (22.3-5)	Review  Quiz 2 (Unit 3)
11-15 Feb	<b>Unit 5</b> Electric potential energy (23.6)	Applications of Gauss's law	<b>Unit 6</b> Electric potential (23.1-5)	Review  Quiz 3 (Unit 4)
18-22 Feb	<b>Unit 7</b> Conductors and capacitance (24.1-2)	Electric potential	<u>DC Circuits</u>  <b>Unit 8</b> Capacitors (24.3-4)	Review  Quiz 4 (Unit 6)  Help session 12-12:50 in Eng 027
25 Feb-1 Mar	<b>Exam 1 (<i>Electricity</i>, 8 AM in assigned room and seat; see BB)</b>	A model for circuits I, Capacitors	<b>Unit 9</b> Electric current (25.1-4)	<b>Unit 10</b> Kirchoff's rules (25.5)  Quiz 5 (Unit 8)
4-8 Mar	Review	A model for circuits II, Kirchoff's rules	<b>Unit 11</b> RC circuits (25.6)	Review  Quiz 6 (Unit 9)
11-15 Mar	<u>Magnetic force</u>  <b>Unit 12</b> Magnetism (26.1-2)	RC circuits	<b>Unit 13</b> Forces and torques on currents (26.3-4)	Review  Quiz 7 (Unit 11)
18-22 Mar				
25-29 Mar	<u>Magnetic field</u>  <b>Unit 14</b> Biot Savart law (27.1-2)	Magnetic force and torque	<b>Unit 15</b> Ampere's law (27.4)	Review  Quiz 8 (Unit 13)  Help session 12-12:50 in Meyr 030
1-5 Apr	<b>Exam 2 (<i>DC circuits, magnetic force</i>, 8 AM in assigned room and seat; see BB)</b>	Biot-Savart law and Ampere's law	<u>Faraday's law and Inductors</u>  <b>Unit 16</b> Motional emf (28.4)	<b>Unit 17</b> Faraday's law (28.1-3)  Quiz 9 (Unit 14)

8-12 Apr	Review	Faraday's law	<b>Unit 18</b> Induction and RL circuits (28.6-8)	Review Quiz 10 (Unit 17)
15-19 Apr	<b>Unit 19</b> LC and RLC circuits (29.4)	RL and LC circuits	Review	<u>Thermodynamics</u> <b>Unit 20</b> Introduction to thermodynamics Quiz 11 (Unit 18)
22-26 Apr	<b>Unit 21</b> Heat and temperature (17.1-2, 18.1-5)	Exam review	<b>Unit 22</b> Ideal gas (17.3-4, 18.6-8)	Review Quiz 12 (Unit 19) Help session 12-12:50 in Eng 027
29 Apr-3 May	<b>Exam 3 (<i>Magnetic field, Faraday's law and inductors</i>, 8 AM in assigned room and seat; see BB)</b>	Ideal gases and the First law of thermodynamics	<b>Unit 23</b> Equipartition, heat capacity, and conduction (20.1, 4)	Review Quiz 13 (Unit 22)
6-10 May	<b>Unit 24</b> Heat engines (19.1)	Equipartition and Heat engines	<b>Unit 25</b> Reversible processes (19.2-7, 18.9)	Review Quiz 14 (Unit 24)
13-17 May	Review			
As late as 22 May	<b>Final exam (Comprehensive).</b> Time and date TBA in assigned room and seat; check BB). Date could be <b>as late as 22 May</b> , see later BB announcement and UMBC <u>Common</u> Final Exam schedule.			