**AP Physics C (Electricity and Magnetism) Spring 2024**

**PHYC 122 Ball State University (Dual credit)**

**Lectures on MWF 9:00-10:50 AM**

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| **Instructor: Godfrey Walwema Office: Elliott Hall B009F**  **Email: Godfrey.walwema@bsu.edu** |
| **Office hours:** MTW F: 2:00 - 4:00 PM  Th: 11:00 - 1:00 PM  & by appointment |

# Learning outcomes

This is the second semester of a two-semester calculus-based course in AP Physics C. The goal of the course is to understand the core-principles of electromagnetism that dominate our everyday experiences. These include the basic rules of optics underlying the physic of light, which is a type of electromagnetic wave. Electrical energy and its usage form the very foundation of our modern society; its presence is pervasive ranging from household appliances to the lighting of our homes. The electromagnetic force, one of the four fundamental forces of nature, plays a central role in holding the stellar masses together, by providing a stabilizing force that offsets the crushing attractive force due to gravity. Such seemingly disparate topics can in fact be understood by developing a unifying framework for studying classical electromagnetism.

Our aim in this course is to cover the basics of electromagnetism: concepts of electricity, electrical charges, forces, fields, energy and electronic circuits. In addition, elements of atomic/nuclear structure will also be covered. This will give us an appreciation about the structure and colorful properties of matter and also about the various forces that hold atoms together. Finally, we will explore the laws of thermodynamics with everyday applications.

At the conclusion of the course, students will be able to:

1. Use electrical and magnetic field lines and their energy in understanding electromagnetic phenomena
2. Understand the basics of electrical circuits
3. Examine the wave motion as a mode of energy transfer
4. Appreciate the richness of the atomic world

# Texts & materials

Online Textbook [College Physics - OpenStax](https://openstax.org/details/books/college-physics)<https://openstax.org/books/college-physics/pages/preface>

Textbook: The Princeton Review: Cracking the AP Physics C Exam 2019 Edition.

**Internet Resources**: <https://www.nsf.gov/news/classroom/physics.jsp>

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Physics Videos are available on CANVAS.

# Virtual classes

On days when there is no in-person class, reading materials will be posted on the Canvas. Please note that Canvas will be the main repository for class materials and will be used for posting of assignments and making announcements.

# Class attendance, preparation and expectations

Successful learning of physics entails becoming familiar to definitions and core concepts and their applications. It is very important to study and learn the material as covered in class as successive classes will build on concepts covered previously.

**Student Accommodation Policy**

Students possessing an educational 504 or IEP should contact the instructor as soon as possible to arrange for any accommodations that may be needed. Likewise, if you feel that you could benefit from an educational 504 or IEP, feel free to contract the instructor to this regard

# Evaluation

Homework: Homework assignments based on class presentations will be provided periodically. **They are due within a week after their receipt.**

Labs: The various concepts learnt during instructions will be illustrated in the lab periods. **Lab activities will be performed in groups of 3-4 students.** Successful completion of each week’s lab will entail performing the experiment carefully, recording pertinent data and observations completely, and turning in a complete and correct write-up of data analysis and results. Some lab days are reserved for instructions.

**Lab reports from each group (data, analysis, and results) are due at the beginning of the next lab.**

Tests: **Three in-class tests** **and a comprehensive final exam** (please see below). Tests may be comprised of a variety of question types, including fill-in, multiple choice, short answer, and problem solving. The tests are not cumulative (but note that each topic builds on previous topics). Test topics would be announced at least a week prior to the test date.

Weighting: Lab 25%; Homework 15 %; Final exam 30%; In-class tests carries 30%

Grading: Specific letter grade will be assigned according to the following scheme:

A: 85% and above

B: 74-84 %

C: 65-74%

D\*: 55-64 (Retake course)

# Make-up work

Make-up work will be allowed only for the excused absences. Arrangements must be made for the makeup work before or immediately after the excused absence.

# Late-work

Late homework assignments may be accepted up to one week after the due date with a penalty of 20% of the maximum points on that assignment. However, if the delay is due to an excused absence or with valid reasons, the instructor may reduce or forego the penalty.

# Attendance Policy

## You have made a commitment toward academic achievement by attending the Academy – both attendance and integrity are essential components to that success.

Class attendance is **mandatory**. An unexcused absence on the day of a lab or test will result in an **automatic** **zero** for that lab or test. *Missing homework, quizzes and/or tests during an excused absence must be made up as soon as possible. It is the student’s responsibility to make arrangements with the teacher.*

It is also important that your brain be here as well as your body. Students who fall asleep in class will receive either a ‘tardy’ or an ‘absent’ mark from the instructor, depending on circumstances. Make sure you avoid this by getting enough sleep the night before! Late arrivals after 15 minutes into class-time will result in an absence for that day.

# Use of computers and mobile devices in classroom

Laptop can be used in the class only for class works such as taking notes and reading class notes. Laptop/smartphone may not be used for e-mail, playing music or games, messaging, web browsing or downloading any files during the class period. If this becomes a chronic problem, an unexcused absence for that day would be assigned. A student should be prepared to use pen and paper when asked. All items being worked on should remain visible on the screen and be available for inspection. A laptop or any other mobile device can’t be used during an exam or test.

**LLM and other AI Fair-Use Policy**

Basic AI tools (spell-check, word-count, grammar, etc.) that assist with correcting errors and gathering information about your own work is not only accepted, but also encouraged!

More advanced AI tools such as LLMs (ChatGPT, LLaMa, Phi-1, etc.) that generate information or code may be used as a starting point for research or creative projects, but generated material should not (for several reasons!) be turned in as your own work. Using these LLMs can be very useful in helping you create a project and/or learn complex topics, but diligence is required to:

\*Completely\* verify that all information provided by the LLM is accurate (this is a major problem, especially in the sciences!). Remember that these models pull non-vetted information from the internet, which will include non-expert, and sometimes malicious, sources.

You (and your grades) are responsible for any and all errors gathered in this manner.

Resist turning in LLM produced material as your own work. The point of being at the Academy is to use provided information as a spring-board for your own intellect and creativity. Using these tools to help you gather ideas, or to find alternate ways to express your ideas, is both welcomed and encouraged. But make sure that you are not falling for temptation to use likely-erroneous data or logic that LLMs often provide. In other words, treat LLM generated material as you would other **non-expert** sources of material.

Presenting AI-generated material as your own will count as plagiarism, and will be dealt with accordingly (see Academic Dishonesty Policy).

**Academic Dishonesty Policy**

In addition, it is imperative to your continued success that you exhibit academic integrity at all times. This entails:

* never submitting another person’s work as your own; this includes LLM and other AI generated information (see: **LLM and other AI Fair-Use Policy**, below)
* never engage in “drylabing.” (artificially manufacturing lab data and submitting it as part of a lab report)
* never cheating on quizzes and/or tests.
* following all ethical standards as described in your student handbook (see “Academic Dishonesty”)

*IMPORTANT: If you feel you have been unfairly accused of failing an academic integrity standard, you have the option and right to appeal to the Indiana Academy Academic Integrity board.*

# Academic progress report

An academic progress report will be sent out as per the Academy policy for unsatisfactory performance in the course.

# Academic Honesty

Academic dishonesty may be detrimental to a student’s grade for the course. Academy dishonesty includes but is not limited to:

* Plagiarism
* Manipulating lab data to obtain expected results
* Copying lab report from another student
* Copying in the tests and exams

For details, please refer to the Academic Dishonesty Policy in the Student’s Handbook

**Inclusion Policy**

Ball State University aspires to be a university that attracts and retains a diverse faculty, staff, and student body. We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse as expressed in our Beneficence Pledge and through university resources found at cms.bsu.edu/campuslife/multiculturalcenter.

*If you see any behavior that goes against the above policy, please bring it to my attention (or have someone you trust do so if you are hesitant). Alternatively, you can find the Bias-Incident form at academy.bsu.edu/forms to report the incident directly to your DEI Coordinator*

# Indiana Academy Mask Policy

There is currently no campus wide mask-mandate, but if the CDC declares another health-emergency, and BSU puts a mask-mandate in place, this policy may change. If and when masks are required by BSU campus, the Indiana Academy will then follow the same procedure.

**In case of extreme COVID-19, break glass for online policy**

As it is possible that we may have to re-face pandemic conditions this year, there may be periods when some (or all) of us return to masks and/or are moved to online learning due to necessity or mandate. All of the below rules apply during e-learning, but some information may be useful:

Zoom Link: https://bsu.zoom.us/j/9429392891, if a password is required, please use AP1AND2

Lectures: Classes will be provided on Canvas with the same frequency and schedule of the normal school year. It is your responsibility to view these videos w/o 24hours of their posting. It is vitally important to watch them \*in order\*.

Homework: Homework can easily be scanned or photographed and emailed to me on the due-date required.

Laboratory: Labs will be designed to be done either in a discussion format on Zoom, or with common equipment found in standard homes. Any documentation (journals, reports, etc) expected can be returned to me using the same procedure as HW.

Testing: Tests will be “given” and “collected” at very specific times (TBA). Future circumstances may require different methods, but currently the procedure is as follows:

* The test will be released on Canvas at a very specific day/time that will be announced several days in advance.
* You will have a set amount to time to complete your exam (will be announced on test day, and is tied to the length of that particular test).
* Returning your test to me will be as simple as scanning or photographing your exam and emailing it back to me before the given time has expired. 504/IEP accommodations (see below) will be honored.

**Electricity and Magnetism Course Outline**

Weeks 1-2: **Electrostatics**:

Charges and Fields (Labs and HW)

Week 3: E-fields, Forces, Gauss’ law (Labs and HW)

Weeks 4-5: E-potential and energy (Labs and HW)

Week 6: **Test 1**

**Conductors, Capacitors, and Dielectrics**:

Week 7: Electric Circuits (Series/Parallel), power, resistance

Week 8: Ohm’s and Kirchhoff’s, Applied DC Circuits (Labs and HW)

Week 9: **Magnetism Fields:**

(Solid State magnets and B-fields due to currents/charges) RHR 1

Week 10:  Ampere’s Law and RHR 2 (Labs and HW)

Week 11: **Test 2**

Biot-Savart Law, force on current-crying conductors

Week 12: Lenz’ and Faraday’s Law; AC Circuits (HW)

Week 13: **Electromagnetic Induction:**

Magnetic Field Applications (consequences of induced currents), Faradays and Lenz’s Laws

Week 14:  LR circuits

Week 15: Maxwell’s equations and their applications.

Week 16: Course Review and Practice **Test 3**

Week 17: **Final Exam**

# Changes to the syllabus

The content of this syllabus is subject to change. Changes will be announced in class or via online communications.