PHY 320: Intermediate Physics Lab II

West Chester University

Spring 2022

Instructor Office Hours

|  |  |
| --- | --- |
| Day | Time |
| Monday | 11:30 – 12:30 PM |
| Wednesday | 11:30 – 1:30 PM |
| Friday | 11:30 – 1:00 PM |

**Dr. Brandon Mitchell**

Office: SECC - 357

Email: [Bmitchell@wcupa.edu](mailto:Bmitchell@wcupa.edu)

Please sign up for office hours at my [online scheduler](https://calendly.com/prof-mitchell)

Course Details

**Location:** SECC-373

**Time:**  Tuesday from 3-6 PM

Course Description

**Required Textbook:**

* An Introduction to Error Analysis, 2nd edition, J. R. Taylor
* Designing Science Presentations: A Visual Guide to Figures, Papers, Slides, Posters, and More, Matt Carter
* How to Write a Scientific Paper, Jari Saramäki

**Recommend Textbook:**

* Attaway, S. (2013). Matlab: A Practical Introduction to Programming and Problem Solving. Butterworth-Heinemann.

Course Summary

This advanced lecture and laboratory course builds upon the writing and skills developed in PHY310. Students will conduct three experiments, analyze data, and come to evidence-based conclusions. In addition, explicit instruction will occur on writing and presenting in the discipline of physics. Students will write two one-page conference abstracts and two full research papers and present a research talk describing the experiments and their findings to the department.

Additional Course Content Information

During the PHY 310 sequence, you conducted investigative experiments on the parameter space surrounding several classic experiments from the 19th and 20th centuries designed to measure a fundamental constant of nature, such as the charge of the electron (e), and Planck's constant (h). In PHY320, you will do similar things, but with "effects.” You will be conducting experiments where the outcome is an effect described by a theory with a parameter that changes between studied systems such as the g-factor, lattice spacing in a crystal, or the Verdet constant. You will gain an understanding of how the properties of materials or systems are determined by their relationship with other measurable quantities through a theory or model and find ways that the experiment can be improved or modified. You will be OK with not genuinely knowing or fully understanding what you are looking for as you are conducting an experiment. In fact, some experiments may require you to learn additional material not covered until PHY420 (Quantum Mechanics I) or Solid-State Physics, such as the Zeeman effect or X-Ray Diffraction analysis. This happens all the time. I am probably reading a bunch of papers right now to understand a topic that I am not familiar with in order to write a grant to perform an experiment tangentially related to it. That's physics!

Course Web Page

# The D2L page will be a critical resource for experiment videos, documents, and for submitting assignments. The entire course is housed on D2L.

Student Learning Outcomes

## **Writing Emphasis Course**

This course is designated as a Writing Emphasis (WE) course in the WCU General Education Curriculum. As a Writing Emphasis course, this course will focus on informal and formal writing that occurs in the discipline of Physics. A major activity for the course is the writing of a scientific paper through multiple drafts and explicit lessons on disciplinary conventions.

Writing-emphasis aspects of the course are directly linked to the general education goals at West Chester University. This course will focus on these two general education goals:

***Communicate Effectively***. To achieve this goal, this course will strive to achieve the following student learning outcomes:

* + *Express oneself effectively in common college-level written forms*. Writing assignments will occur throughout the semester. Feedback and guidance will be provided often. The major writing assignments for this course are two research-style scientific reports. More details can be found in the assignment sections. (Writing-Emphasis)
  + *Revise and improve written and/or presentations.* One of the major assignments for this course is the writing of a conference proceeding. The creation of the conference proceeding will be an iterative process starting with critically thinking about your experiment. As you write your conference proceeding, you will be provided with multiple opportunities to receive feedback and revise.

***Think critically and analytically***. To achieve this goal, this course will strive to achieve the following student learning outcomes:

* + *Reach sound conclusions based on a logical analysis of evidence.* Your scientific paper will provide an excellent opportunity to demonstrate your ability to analyze collected data and draw logical, evidence-based conclusions. Throughout the course, you will be provided with opportunities to analyze data and make sound conclusions. In addition, you will receive feedback on your attempts.

## **Program Course Design**

This course is designed to meet multiple goals in the Bachelor of Science Physics program:

1. Students will be able to conduct physics experiments while minimizing uncertainties (e.g., instrument, statistical, systematic) as well as illegitimate errors
2. Students will be able to analyze data collected from physics experiments following the best practices of data analysis and draw evidence-based conclusions
3. Students will be able to convey the results of an experiment by oral presentations such as a poster or talk
4. Students will be able to convey the results of an experiment to a diverse audience and in a variety of written forms (e.g., experiment proposal, conference abstract, and formal manuscript).
5. Students will understand the experimental design process and be able to develop and convey the reasoning behind an experimental method.

## **Summary of Assessments**

The table below captures the assessments of learning outcomes identified with the different general education goals.

WE = Writing Emphasis

|  |  |  |
| --- | --- | --- |
| **Gen Ed Goal** | **Learning Outcome** | **Evaluation Activity** |
| Communicate Effectively | **WE:** *Express oneself effectively in common college-level written forms* | Abstracts on Experiments #1 and #2. (formal)  4-6 page papers on Experiments #2 and #3. (formal) |
| Communicate Effectively | **WE:** *Revise and improve written and/or presentations* | Three revisions of the conference proceeding. Feedback on experiment analysis. |
| Think Critically & Analytically | **WE:** *Reach sound conclusions based on a logical analysis of evidence* | Reading Summaries.  Conference Abstracts.  Conference Proceeding. Research paper. |

The program-level goals will be assessed as follows:

1. Students will be able to conduct physics experiments while minimizing uncertainties (e.g., instrument, statistical, systematic) as well as illegitimate errors.

*Assessment*: A student successfully achieving this goal will be assessed from the completion of the Zeeman Effect experiment and two additional experiments. The data collection will be reviewed during the scientific presentation and within the two 4-6 page written reports.

1. Students will be able to analyze data collected from physics experiments following the best practices of data analysis and draw evidence-based conclusions

*Assessment*: A student successfully achieving this goal will be assessed from the completion of all three experiments. The data analysis will be reviewed during the scientific presentation and all four written assignments.

1. Students will be able to convey the results of an experiment by oral presentations such as a poster or talk.

*Assessment*: A student successfully achieving this goal will be assessed from the completion of their second experiment. In particular, their scientific talk given to the Department will be assessed by faculty present.

1. Students will be able to convey the results of an experiment to a diverse audience and in a variety of written forms (e.g., experiment proposal, conference abstract, and formal manuscript).

*Assessment*: Overall, each student will write two conference abstracts, a conference proceeding, and a full scientific report. The abstracts, conference proceeding, and scientific report will all be assessed.

1. Students will understand the experimental design process and be able to develop and convey the reasoning behind an experimental method.

*Assessment*: A student successfully achieving this goal will be assessed from the completion of their three main experiments. In particular, the thinking behind their scientific approach and the depth of their scientific understandings will be probed during their scientific talk and analyzed in their two 3-5 page written reports.

# **Course Elements**

## **Exploration of Physical "Effects"**

PHY320 will build upon PHY310 and reinforce the ideas of how to conduct an experiment, keep track of uncertainty, and come to a conclusion based upon the analysis of the data. In this case, you will be conducting an experiment where the outcome is an effect described by a theory with a parameter that changes between studied systems such as the g-factor, lattice spacing, or the Verdet constant. During the semester, you will complete the analysis of three experiments from the list of PHY 320 experiments below.

For the 1st experiment, EVERY STUDENT will perform The Zeeman Effect experiment.

For the 2nd and 3rd experiment, you can choose any of the folowing experiments:

1. The Faraday Effect.
2. Electron Spin Resonance.
3. Nuclear Magnetic Resonance.
4. X-Ray Diffraction Analysis of NaCl.
5. The Hall Effect
6. Spacial Light Modulation.
7. Quantum Cryptography
8. Lock-in Amplifier
9. *Optical Tweezers\**
10. *Raman Spectroscopy\**

You will write a one-page conference abstract for the first two experiments. You will also prepare a research presentation and full "conference proceeding" for the second experiment. Lastly, you will write a full research paper for the third experiment.

## **Pedagogical tools**

* Post-reading Paragraphs – Students will submit 1-2 paragraph summaries after each reading assignment describing what the key points were and anything that was new or stood out to them. These will be shared with the class and submitted via D2L to be reviewed by the instructor.
* *Writing and Speaking Reflections* – After their scientific talk and final submission of the conference proceeding, students will be asked to reflect upon the process of writing a scientific paper and creating a scientific presentation. These reflections will be guided by prompt questions provided by the instructor.
* *Mini-project Abstract* – Students will write a one-paragraph abstract summarizing the results of a quick 30 min experiment. This will be used to develop the student's formal writing and ability to home in on key points/results from an experiment, even one as "clear" as determining the speed of light or sound.
* *Group Meetings* – Group meetings represent a common convention in science. A Group Meeting is when the research team meets periodically (e.g., weekly or monthly) to informally discuss research projects. The lecture will sometimes take on the form of a group meeting in which students will share the progress of their experiments and discuss the next steps.

## **Major Assignments**

* *Conference Abstracts* – The students will write two one-page abstracts on their first two experiments. These abstracts will follow the typical one-page with a figure and reference format found in many physics conferences. This format allows the students to practice their ability to develop a key argument, and provide concise support for the argument as well as motivate why the results should be brought to the scientific community.
* *Conference Talk* – Students will present the result of their second experiment in a scientific talk to the Department of Physics and Engineering. The Department will play the role of the hypothetical audience discussed in the scenario.
* *Conference Proceeding –* After writing a 1-page abstract and giving a 12-minute presentation with Q&A, the students will complete the "conference experience" by writing a 3-5 page paper on the experiment, utilizing feedback gained during the abstract writing, practice talks, and formal presentation. Explicit instruction will occur over the semester regarding the structure of the report, the expected disciplinary conventions to follow, and the appropriate level of critical thinking captured by the report. They will get two draft and revision cycles.
* *Scientific Report –* Students will write a 3–5 page scientific report stating the findings of their third experiment. The students will be expected to incorporate all of the feedback from the previous three major writing written assignments and the presentation for this paper. They will get one draft and revision cycle.

# **Course Flow**

It is sometimes challenging to see the forest from the trees. All the details provided in the course-design and course-elements section make it challenging to get a feel for the flow of the course. This section aims to correct that.

## **Coaching and Feedback**

Receiving coaching and feedback will play a critical role in the development of your critical thinking about your experiment, writing your scientific report, and preparing your scientific talk. Below is an outline of the coaching and feedback you will receive through the semester.

### Weeks 1 through 3 (Experiment #1 and Written Abstract Design)

*Reading:* You will read Chapters 1-7 in Saramaki (~40 pages) by the end of Week 2. This will provide additional insight on choosing key points, writing the opening paragraph to a 1-page abstract, how to outline a paper, and how to write an introduction.

*Reading:* You will also read Chapters 1-2, 6-8 in Carter (~70 pages) by the end of Week 3. This will provide additional insight on the thinking of scientists as designers, different presentation styles, and how to format tables, graphs, and figures.

*Writing:* Your first formal piece of writing will be a 1-page abstract on the Zeeman Effect submitted in week 3. Writing the abstract will provide an overview of the common content found in scientific papers. This abstract will be reviewed and returned to you for edits with resubmission due at the end of **Week 4**.

*Speaking:* I will give a presentation on the Zeeman Effect in the format expected of your presentations. We will then go through the various design and execution points of the slides and talk itself.

### Weeks 4 through 7 (Experiment #2 and Presentation Design)

*Reading:* You will read Chapters 8-12 in Saramaki (~20 pages) by the end of Week 7. This will provide additional insight on how to write the introduction, methods, results, and discussion sections of a paper.

*Reading:* You will also read Chapters 3-5, 13-18 in Carter (~110 pages) by the end of Week 7. This will provide additional insight on color and font choices, as well as slide design.

*Writing:* Your second formal piece of writing will be a 1-page abstract on your second experiment will be submitted in week 6. This abstract will be reviewed and returned to you for edits with resubmission due at the end of week 7.

*Speaking:* You will be explicitly taught about the structure of a scientific talk.

*Speaking:* You will be explicitly taught about the voice and delivery of a scientific talk.

*Speaking:* You will submit annotated PowerPoint slides at the end of week 7. Your submission will be reviewed with a focus on the quality of the slides as well as the tone and word clutter. Your submission will be assessed, and feedback will be provided.

*Speaking:* You will be explicitly taught about body actions such as hand gestures and eye contact.

### Weeks 8 through 10 (Experiment #3, Practice Talks and Paper Design)

*Reading:* You will read Chapters 13-15 in Saramaki (~10 pages) by the end of Week 9. This will provide additional insight on writing your first draft of a long (4-6 page) manuscript and editing it.

*Reading:* You will also read Chapters 15 in Carter (~11 pages) by the end of Week 9. This will provide additional insight on writing scientific papers.

*Writing:* You will be explicitly taught about word choice.

*Writing*: You will be explicitly taught about the style and voice found in scientific reports.

*Writing:* You will be explicitly taught about paragraph structure found in scientific reports.

*Writing*: You will be explicitly taught about sentence mechanics found in scientific reports.

*Writing:* You will craft the first draft of your conference proceeding. Your paper will first be assessed for its thesis, general organization, audience, and development of evidence-based conclusions. Issues with these elements will be pointed out, and you will need to revise and resubmit your work.

*Writing:* You will craft the second draft of your conference proceeding. Your paper will now be assessed for word choice as well as other glaring issues. Issues with these elements will be pointed out, and you will need to revise and resubmit your work.

*Speaking:* You will give a practice talk to your peers and me. We will provide feedback in the form of a Q & A session. You will actively participate in the Q&A for other presenters.

*Speaking:* You will submit your slides for a second time for review after your practice talk. Your slides will be reassessed and returned.

### Weeks 11 through 13 (Faculty Talks and Paper Feedback)

*Writing:* You will craft the third draft of your conference proceeding and submit it. Your paper will now be assessed for paragraph structure and sentence structure. Issues with these elements will be pointed out, and you will need to revise and resubmit your work. These will be turned in no more than three days after your presentation.

*Speaking:* You will give your Department presentation of your scientific talk. You will receive instructor-level feedback about how you handled the question-and-answer session as well as department-level feedback from all faculty in attendance about your presentation.

### Week 14 (Paper Feedback)

*Reading:* You will read Chapters 16-17 in Saramaki (~10 pages) by the end of Week 11. This will provide additional tips on editing.

*Writing:* You will craft the 1st draft of your Research paper on your third experiment. All issues ranging from thesis and audience to word choice will be assessed. Issues with these elements will be pointed out, and you will need to revise and resubmit your work.

# **Other Important Procedural Issues.**

The Laboratory Notebook

You will maintain a laboratory notebook for the experiment as you did in PHY 170/180/310. Your laboratory notebook will serve as the foundation on which your research papers and presentation are built. Your laboratory notebook must be available for review at all times to substantiate any of the claims that you make in your research papers or presentation.

Laboratory Practices and Data Analysis

All experimental apparatuses will be set up for you, but you will need to do certain procedures such as alignment and calibration. You must develop your own procedures for conducting an experiment and analyzing the data. This arrangement is designed to encourage you to engage in professional conduct. In general, in the sciences, laboratory facilities and laboratory equipment are shared due to their high cost. Consequently, coordination, cooperation, and consideration are critical to everyone's success.

Finally, take note that all of the experiments "work." That is when all of the equipment is calibrated, and when the experiment is executed properly, the experiment produces a result that is consistent with results published in the professional literature. If the value that you obtain is not in agreement with (or consistent with) values published in the professional literature, you must take the following actions to discover what error has occurred and fix it. (1) Where possible, calibrate the equipment and make sure it is working properly (which you should have done before doing the experiment). (2) Check the equipment for defects and damage (which you should have done before doing the experiment). (3) Consult a faculty member regarding the procedure or the data analysis. (4) Ask me to check the equipment. Do not disassemble or attempt to repair equipment. Leave that to me.

Bear in mind that professional scientists have no reference values against which to compare their results, but they do have extensive experience conducting experiments, and they execute their experiments with great care. In this class, you will be acquiring the kind of experience that allows you to execute experiments with great care, and one component of that experience involves comparing the results of your experiments to well-established values in the literature. Because you know "the answer," you might be tempted to commit all kinds of terrible crimes against the data. Stay Honest!

Caring for Equipment

The equipment that you will use to conduct experiments during this course is quite expensive. The total cost for all the equipment in the lab exceeds $500,000. Single items can be quite expensive, too. For example, the Fabry-Perot etalon costs $3,500, the x-ray diffractometer costs $22,000 and the Princeton Instruments Pixis CCD camera costs $85,000.

Food and Drink are strictly prohibited in the Labs

Upon the first offense, your in-person access privileges will be revoked.

Despite the high cost of the equipment, caring for the equipment requires no special training. Simply put, plan ahead. All of the manuals for the equipment in the lab are available on D2L, and all of the manuals describe how to handle the equipment safely. I expect you to read the manual for each piece of equipment from cover to cover before using the equipment. (The colloquial notion that "nobody reads the manual" is a myth. Read the manual!) Familiarize yourself with the equipment before using it. Create a "script" of all of the actions that you are going to execute during an experiment before you execute them. Review that script. Think about all of the ways you might harm the equipment before you take any action. When you are confident that your actions will not harm the equipment, then proceed with the script.

Draft Review

Throughout the semester, you will have many opportunities to revise your written assignments. I will meet with each of you individually for 10-20 minutes to comment on your drafts before you submit the final version to me for a grade. Note: abstracts have 1-2 revise and resubmit cycles, and the conference proceeding has three revise and resubmit cycles. For each draft review, you must submit what you intend to be the final draft of the abstract. I will not review a draft that is incomplete or does not represent an authentic attempt to be complete.

Research Presentation

After your second experiment, you will give a talk describing your result to an audience of your peers and professional scientists, notably the faculty in the Department of Physics. Your talk is limited to 12 minutes in a ~20-minute time slot, leaving 8-10 minutes for questions. You will submit slides several times to be revised. You will also give a mock presentation to your peers. For your formal presentation, the faculty and I will provide additional written feedback on your presentation afterward.

Assessment

Your "grade" in this course will be based on your performance in the following categories of assessment with the following weights.

(1) Participation………………………………………… 5%

(2) Conference Abstract…………………….. 7.5% each

(1) Research Presentation ………………… 30%

(1) Conference Proceeding………………... 25%

(1) Research Paper………………................. 25%

I will assign each paper, abstract, and presentation a letter grade of A, B, C, D, or F, based on my professional judgment. (My grading criteria for the papers and presentations are articulated in the paper and presentation rubrics posted on D2L.)

Note that I am not the sole judge of your performance. During the research presentations, other faculty in the Department will evaluate your work and submit their evaluations to me for consideration.

PHY320 Disclaimer

It is common for students to not attend other physics classes nor complete homework assignments due to time spent on PHY320 experiments, presentations, or papers. This class is NOT an acceptable excuse to miss other courses, and I expect you will find time to complete all of the work assigned in your other classes.

A letter grade will be assigned based on performance in the course according to the following scale:

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade** | **Quality Points** | **Percentage Equivalents** | **Interpretation** |
| A | 4.00 | 93-100 | Excellent |
| A- | 3.67 | 90-92 |  |
| B+ | 3.33 | 87-89 | Superior |
| B | 3.00 | 83-86 |  |
| B- | 2.67 | 80-82 |  |
| C+ | 2.33 | 77-79 | Average |
| C | 2.00 | 73-76 |  |
| C- | 1.67 | 70-72 |  |
| D+ | 1.33 | 67-69 | Below Average |
| D | 1.00 | 63-66 |  |
| D- | 0.67 | 60-62 |  |
| F | 0 | < 60% | Failure |

Refer to the Undergraduate Catalog for a description of NG (No Grade), W, Z, and other grades.

Straight percentages will be given for all work, with the mid-semester and final grade based on overall class performance. Other considerations will influence your final grade, including class participation, class and laboratory attendance, and seeking timely guidance during office hours.  Any student achieving at a level of 'C-' or below will be given an estimated grade on their mid-term deficiency grade report.

Office Hours

You set the agenda for office hours. Come with questions about the lecture, reading, homework, exams, grading, or anything else of concern or interest. Note: You must demonstrate some effort/thought process towards an answer to homework problems before coming to see me. "I have no idea where to begin" is not an acceptable opening statement.

Attendance Policy

Students are expected to attend 85% of online ZOOM sessions. Students will be held responsible for all course materials missed due to class absences. All efforts will be made on my behalf to ensure that class time is productive and beneficial for your learning. We will go through several examples with problem-solving strategies. You are expected to attend all labs; see the laboratory section for more details. Obviously, if you are sick or unwell, then you should not attend class. Students who have more than nine absences by the end of the term will be reported as having poor attendance. Students who fail the course while having poor attendance may receive a "Z" grade (see the WCU Title IV Federal Financial Aid Compliance Policy).

If you miss a class, it is your responsibility to make up the missed learning opportunity by reviewing the lecture slides, readings, and other course materials. You are welcome to seek assistance during office hours, but I cannot reproduce an entire lecture outside of class. Missing class does not excuse you from completing other aspects of the course on time.

Excused Absences

This course adheres to the WCU Excused Absences Policy. If you are unable to perform an aspect of the course due to a conflict recognized by this policy (which includes University- Sanctioned Events), you must notify me in advance so that we can make arrangements. Documentation verifying your participation in the event must be submitted via D2L (path: Assessments>Assignments>Documentation for excused absences).

Late Work Policy

As with all summer courses, this is a very fast-paced course. There will be three homework assignments due each week, as well as the final group project. Please e-mail one of the instructors **BEFORE** the due date, and we will try to accommodate your situation.

Office Hours

You set the agenda for office hours. Come with questions about the lecture, reading, homework, exams, grading, or anything else of concern or interest. Note: You must demonstrate some effort/thought process towards an answer to homework problems before coming to see me. "I have no idea where to begin" is not an acceptable opening statement.

COVID-19 STATEMENT

Part of West Chester University's response to the COVID-19 pandemic was to switch the vast majority of instruction to remote. This decision was made out of an abundance of caution to protect the health of all members of the WCU community. Faculty have been asked to make every effort to adapt their courses to this novel situation while still meeting the critical learning outcomes of the course. Students are asked to discuss any problems with the new course format and schedule directly with their instructors. Patience and flexibility on everyone's behalf are critical to our community's navigation of this public health crisis.

ACADEMIC & PERSONAL INTEGRITY

Students are expected to follow all WCU rules and guidelines on academic integrity as described in the WCU Undergraduate Catalog. It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's [Services for Students with Disabilities (OSSD)](https://www.wcupa.edu/universityCollege/ossd/), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, and their e-mail address is [ossd@wcupa.edu](mailto:ossd@wcupa.edu) In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

EXCUSED ABSENCES POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

**Inclusive Learning Environment and Anti-Racist Statement:**

Diversity, equity, and inclusion are central to West Chester University’s mission as reflected in our [Mission Statement](https://protect-us.mimecast.com/s/Kh8QCrk6x5SDqM24CQRU_b?domain=wcupa.edu),[Values Statement](https://protect-us.mimecast.com/s/XD1FCv2kB5Ty91Arswntb5?domain=wcupa.edu),[Vision Statement](https://protect-us.mimecast.com/s/XD1FCv2kB5Ty91Arswntb5?domain=wcupa.edu) and[Strategic Plan: Pathways to Student Success](https://protect-us.mimecast.com/s/ovVXCwplD5TRj6yghld0bL?domain=wcupa.edu). We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU’s [Office for Diversity, Equity, and Inclusion](https://www.wcupa.edu/_admin/diversityEquityInclusion/changeBeginsHere.aspx) (ODEI), DEI committees within departments or colleges, the student [ombudsperson](https://www.wcupa.edu/_services/STU/studentOmbuds/), and centers on campus committed to doing this work (e.g., [Dowdy Multicultural Center](https://www.wcupa.edu/_services/multicultural/), [Center for Women and Gender Equity](https://www.wcupa.edu/_services/stu.wce/), and the [Center for Trans and Queer Advocacy](https://www.wcupa.edu/_services/transAndQueer/)).

Guidance on how to report incidents of discrimination and harassment is available at the University’s [Office of Diversity, Equity and Inclusion](https://www.wcupa.edu/_admin/diversityEquityInclusion/).

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University Protection of Minors Policy. The Office for Diversity, Equity, and Inclusion provides information regarding the reporting of sexual violence and resources that are available to victims of [sexual violence](https://www.wcupa.edu/_admin/diversityEquityInclusion/sexualMisconduct/default.aspx).

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free [WCU ALERT service](http://www.wcupa.edu/wcualert), which delivers official WCU emergency text messages directly to your cell phone. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University-provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

INTELLECTUAL PROPERTY

The instructor utilizes copyrighted materials under the Freedom and Innovation Revitalizing the United States Entrepreneurship Act of 2007 (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyrighted by the instructor, including, but not limited to, lectures, course discussions, course notes, slides, assessment instruments such as exams, and supplementary materials posted or provided to students authored by the instructor. No recording, copying, storage in a retrieval system, or dissemination in any form by any means of the intellectual property of the instructor, in whole or in part, is permitted without prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property, and all such permissions and waivers shall terminate on the last day of the semester in which this course is held.

**West Chester University’s COVID-19 Classroom Protection Requirements:**

We, as a community of educators and learners, should work together to create a culture that protects our most precious resource: each other. As such, it is the expectation of all members of the University community to continue to do their part to protect the health and safety of others. In our classrooms where the university’s primary function is carried out, the following protocols are being implemented:

* Unless otherwise directed by the faculty member, students must wear a cloth or disposable face mask that covers both the nose and mouth the entire time they are in class.
  + Face shields and gaiters do ***not*** meet the university’s mask requirement.
* Eating and drinking in the classroom are only permitted if they are medically necessary.
  + Please work with the Office of Services for Students with Disabilities to notify the university and your professors of this necessity.

**We want you to succeed in this class, but we will have to ask you to leave if you do not follow these guidelines, so please – make the most of this opportunity and help keep our campus safe**.

## PHY320 Course Schedule

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Goals** | **Submissions** | **Reading** |
| **1-3** | * Review the scientific process. * Conduct Zeeman Effect experiment, analyze the results, and draw conclusions. * Discuss the primary modes of writing in the discipline. * Learn about conventions of a scientific abstract and practice writing and rewriting abstracts. * Complete Paramedic Method Examples. | Experiment #1 abstract.  Revised abstract of Experiment #1. | Carter Ch. 1-2, 6-8  Jari Ch. 1-7\* |
| **4-7** | * Conduct Experiment #2, analyze the results, and draw conclusions. * Become familiar with the primary modes of presenting in the discipline. * Learn about voice and delivery of speakers giving scientific presentations. * Learn basics of design, i.e., color palette and typography choices. * Create slides for presentation. * Learn about body actions and movements of speakers giving scientific presentations. | Experiment #2 abstract.  Revised abstract of experiment #2.  Submit initial presentation slides. | Carter Ch. 3-5, 13-18  Jari Ch. 8-12\* |
|  | | | |
| **8-10** | * Take part in a mock presentation session. * Revise slides and delivery based on feedback. * Learn about scientific report style and voice in formal scientific writing. * Learn how to structure a paragraph and how to write a concise and precise sentence. * Learn how to edit 1st drafts of scientific reports. | Give practice talk.  Submit revised presentation slides.  Submit 1st draft of Conference Proceeding.  Submit 2nd draft of Conference Proceeding. | Carter Ch. 10  Jari Ch. 13-15\* |
| **11-13** | * Scientific Talks to Faculty. * Complete worksheets reflecting on the process of writing your Conference Proceeding and developing your presentation.   Conduct Experiment #3, analyze the results, and draw conclusions | Present scientific talk to Department.  Submit 3rd draft of Conference Proceeding. |  |
| **14** | * Write and revise your Conference Proceeding based on feedback. | Submit final draft of Conference Proceeding.  Submit 1st draft of your Research paper.  Writing process reflection. | Jari Ch. 16-17\* |
| **15** |  | Submit final draft of research paper. |  |

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* Taylor, John. *Introduction to error analysis, the study of uncertainties in physical measurements*. University Science Books,1997.
* Attaway, Stormy. *Matlab: a practical introduction to programming and problem solving*. Butterworth-Heinemann, 2013.