

PHYS 220 Introduction to Computational Physics Spring 2021

INSTRUCTOR: Dr. Adriana Rocha Lima
Email: limadri1@umbc.edu
Webex link: <https://umbc.webex.com/meet/limadri1>

Dates and Location:

Tuesday & Thursday 10:00AM - 11:15AM via Webex

⇒ *This course will be taught mostly in synchronous remote mode. This means you will be expected to log in and participate in class sessions at established dates and times.*

OFFICE HOURS: via Webex: Fridays, 10:00AM-11:00AM

Recommended textbooks:

1. Computational Physics, Mark Newman, Revised and expanded.
Sample chapters are available at the author's webpage:
<http://www-personal.umich.edu/~mejn/cp/>
2. Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib, Robert Johansson, Second Edition.
3. Computational Physics: Problem Solving with Python, Book by Rubin H. Landau, Manuel J. Páez and Cristian C. Bordeianu, Third edition.
Python Multimodal eTextBook publically available from
<http://www.compadre.org/psrc/items/detail.cfm?ID=11578>
4. An Introduction to Error Analysis, The Study of Uncertainties in Physical Measurements, Second Edition, by John R. Taylor.

EQUIPMENT:

Computer access (and the possibility of installing software) is required. Students should have a computer with access to the internet every class.

GRADING:

Homework: 30%, Midterm: 25%, Class Activities: 20%, Final Project: 25%.

Final Project will consist of three parts: Proposal 5%, Oral Presentation 10%, and Final Report 10%.

A: 100 – 90; B: 89 -75; C: 74-60; D: 59-50; F: Below 50.

Late homework policy:

I do NOT accept late homework.

Class Attendance and Missed Work

Absences from class and missed work are accommodated (excused) in five circumstances: 1) significant illness, 2) personal instances of distress or emergency, 3) religious observance, and 4) varsity athletic participation and 5) required court or legal appearances. For each circumstance, you will need to present to the instructor supporting evidence (e.g., doctor note).

Coarse Description:

An introduction to the computational packages in Python, with particular emphasis on their use in solving physics problems and analyzing experimental data taken in physics laboratory experiments. Applications to problems in mechanics, electromagnetics and wave propagation will be stressed.

Learning Goals:

By the end of the course, you should be able to:

- Use a high-level programming language (e.g., Python) to write modularized programs and plot simple figures, such as scatter plot, time series, histogram, and 2D contour.
- Write programs to solve physics problems involving ordinary differential-equations (ODE), such as projectile motion with drag and nonlinear oscillation.
- Write programs to solve physics problems involving partial differential equations (PDE), such as finding electrostatic potential and simulating heat diffusion.
- Use Monte Carlo method to simulate and understand random walk problem, such as photon transport in isotropic-scattering medium.
- Have a good mastery of basic data analysis methods, such as linear regression, uncertainty analysis, null hypothesis testing, and Fourier analysis.

At a Glance: UMBC Policies and Resources for Students during COVID-19**UMBC's Vision Statement**

Our UMBC community redefines excellence in higher education through an inclusive culture that connects innovative teaching and learning, research across disciplines, and civic engagement. We will advance knowledge, economic prosperity, and social justice by welcoming and inspiring inquisitive minds from all backgrounds.

Student Safety

In response to the COVID-19 pandemic, it is understood that some students who are enrolled in classes that have an in-person component may have or develop COVID-19 related health concerns coming to campus to attend those classes this semester. No student shall be compelled to attend class or attend an assessment if they have COVID-19 related health concerns. However, for students enrolled in courses having a physical presence component who anticipate not being able to attend the in-person class sessions due to COVID-19 related health concerns, it is advisable to provide notice to the course

instructor at the beginning of the term so that alternate arrangements can be made. Students enrolled in courses with an in-person component who develop COVID-19 related health concerns during the semester should immediately contact the course instructor to discuss alternative instructional arrangements.

Technology: Access, Requirements, Resources, Support

To help ensure that UMBC students are equipped for academic success, the Division of Information Technology (DoIT) provides a wealth of resources and support, including tips for getting online and minimum specifications to consider when purchasing a computer (doit.umbc.edu/students). UMBC does require all students to be technologically self-sufficient, which entails having a reliable personal computer (preferably a laptop with webcam) and Internet access. Since UMBC requires all students to have a computer and Internet access, financial aid may be used to meet this requirement. To learn more, students should contact their financial aid counselor at financialaid.umbc.edu/contact.

COVID-19: Safety Expectations and Guidelines

Students enrolled in this course are expected to adhere to all UMBC policies, rules, and regulations, including COVID-19 emergency health and safety rules, policies, guidelines, and signage enacted for the UMBC community. For students attending in-person classes, signage, policies, rules, and/or guidelines may include but are not limited to specific requirements for face coverings, physical distancing, and sanitization, in addition to efforts to reduce density efforts that involve reductions in seating and room capacity. Please be aware that UMBC's COVID-19 emergency health and safety rules, regulations, policies, guidelines, and/or signage are subject to change as our public health crisis evolves. Any violation will be subject to disciplinary action and may include but not limited to immediate dismissal from the classroom, removal from the classroom and/or campus, a requirement to work remotely, and/or sanctions and conditions enumerated in the [UMBC Code of Student Conduct](#) that may entail suspension or expulsion from UMBC.

Academic integrity in the Online Instruction Environment

Academic integrity is an important value at UMBC. 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. These principles and policies apply in both face-to-face and online classes. Resources for students about academic integrity at UMBC are available at <https://academicconduct.umbc.edu/resources-for-students/>.

Resources to Help you Succeed in Online Courses

Many students need additional support to succeed in online courses. Click on the following links for helpful resources:

- [UMBC's Academic Success Center \(ASC\)](#) provides a range of resources to support students as they progress toward degree completion. They will continue to offer all of their services online.
- The ASC has created a specialized set of [Online Learning Resources](#), including videos and guides to help students succeed while learning online.

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](#) will be online; students can make appointments using this [link](#).
- [SI PASS](#): Supplemental Instruction (SI)/ *Peer Assisted Study Sessions* (PASS). The SI PASS program targets traditionally difficult academic courses, providing regularly scheduled, out-of-class review sessions, happening in Blackboard Collaborate inside your existing Blackboard course.
- [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.

Enrollment Dates and Deadlines

Students must be familiar with the academic policies and enrollment dates and deadlines as published in the [Undergraduate Catalog](#) and the [Academic Calendar](#). They are also responsible for managing their course enrollment(s) accordingly.

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

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

Religious Observances & Accommodations

UMBC Policy provides that students should not be penalized because of observances of their religious beliefs, 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 for religious observances in advance, and as early as possible. For questions or guidance or to request an accommodation, please contact the Office of Equity and Inclusion at oei@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 or who have such matters reported to them should use the online reporting/referral form to report discrimination, hate or bias incidents; reporting may be anonymous.

Sexual Assault, Sexual Harassment, Gender Based Violence and Discrimination

UMBC's Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination and Federal Title IX law prohibit 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 retaliation should contact the University's Title IX Coordinator to make a report and/or access support and resources:

Mikhel A. Kushner, Title IX Coordinator (she/they)

410-455-1250 (direct line), kushner@umbc.edu

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 or thinking about making a report, please see the Online Reporting/Referral Form. Please note that, while University options to respond may be

limited, there is an anonymous reporting option via the online form and every effort will be made to address concerns reported anonymously.

Notice that Faculty are Responsible Employees with Mandatory Reporting Obligations:

All faculty members are considered Responsible Employees, per UMBC's Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination. Faculty are therefore required to report possible violations of the Policy to the Title IX Coordinator, even if a student discloses something they experienced before attending UMBC.

While faculty members want 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 assault, domestic and interpersonal 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.

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:

- The Counseling Center: 410-455-2472 / After-Hours 410-455-3230 [Monday – Friday; Academic Year: 8:30 a.m. – 5 p.m.; Summer: 8:30 a.m. – 4:30 p.m.]
- University Health Services: 410-455-2542 [Monday – Friday 8:30 a.m. – 5 p.m.]
- Pastoral Counseling via Interfaith Center: 410-455-3657; interfaith@umbc.edu [7 days a week; Fall and Spring 7 a.m. – 11 p.m.; Summer and Winter 8 a.m. – 8 p.m.]

Other Resources:

- Women's Center (for students of all genders): 410-455-2714; womenscenter@umbc.edu. [Monday-Friday; Spring 10 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 I report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police.

Pregnancy

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 students are available through the University's Office of Equity and Inclusion. Pregnant and parenting students are encouraged to contact the Title IX Coordinator to discuss plans and assure ongoing access to their academic program with respect to a leave of absence or return following leave related to pregnancy, delivery, or the early months of parenting.

In addition, students who are pregnant may be entitled to accommodations under the ADA through the Student Disability Service Office, and/or under Title IX through the Office of Equity and Inclusion.

The latest language is available on [the OEI website here](#).