

# PHYS 440/640 Computational Physics

Fall 2022

## Dates and Location:

Wednesday and Friday 1:00PM - 2:15PM                      Physics 201

**Instructor:**                      Prof. Zhibo Zhang  
**Phone:**                              410-455-6315  
**Email:**                                Zhibo.Zhang@umbc.edu

**Office Hours:** PHYS417: Friday 2:30PM~3:00PM or Email Appointment

## Texts:

**No required textbook**

## Recommended Books

- “[Computational Physics: Problem Solving with Computers](#)” (2<sup>nd</sup> edition) By R. H. Landau et al.
- “[Computational Physics](#)” by Mark Newman

## Grading:

Homework (30%), Midterm Project (20%), Final Project (30%), Participation/Discussion (20%)

**Course management:** I will use Blackboard to post course announcements, reading assignments and homework assignments, and post grades. In addition I will use Google Colab (<https://research.google.com/colaboratory/>) and/or Github (<https://github.com/>) to post the codes, scripts and data for the course

## COURSE OUTLINE:

❖ **Computer Setup and Programing Warm-Up**

❖ **Part I: Numerical Methods**

- **Monte Carlo method**
- **Numerical Integration and Differentiation**
- **Linear algebra and matrix computing**
- **Ordinary Differential Equations (ODE)**

➤ **Partial Differential Equations (PDE)**

❖ **Part II: HPC experiences:**

❖ **Part III: Data Analysis Methods**

➤ **Data Analysis Basics**

➤ **Regression Analysis**

➤ **Fourier Transformation**

➤ **Empirical Orthogonal Function (EOF) Analysis**

## **Accessibility and Disability Accommodations, Guidance and Resources (required)**

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](https://sds.umbc.edu) for registration information and office procedures.

SDS email: [disAbility@umbc.edu](mailto:disAbility@umbc.edu)

SDS phone: (410) 455-2459

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

## **Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination (required)**

UMBC Policy and Federal law (Title IX) 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](mailto: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 use the Online Reporting/Referral Form. Please note that, if you report anonymously, the University's ability to respond will be limited.

## **Religious Observances & Accommodations**

UMBC Policy provides that students should not be penalized because of observances of their religious beliefs, and that 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 or requested modifications for religious observances in advance, and as early as possible. For questions or guidance regarding religious observance accommodations please contact the Office of Equity and Inclusion at [oei@umbc.edu](mailto:oei@umbc.edu).

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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. You may report incidents that happen to you anonymously. Please note that, if you report anonymously, the University's ability to respond will be limited.