PY 355 - Methods of Theoretical Physics - Spring 2020

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Course Information

PY355 is a survey of mathematical and computational methods used in modern theoretical physics. Mathematical topics include differential and integral calculus; complex variables and analytic functions; vectors, fields, and vector calculus; linear algebra of matrices and function spaces; bras and kets; eigensystems; Fourier analysis; basics of ordinary and partial differential equations. Introduction to scientific programming in Python, computational visualization and numerical methods complementing each of the analytic topics.

Instructor: Prof. Chris Laumann (claumann@bu.edu)

Lectures: Tuesday/Thursday, 12:30-1:45, SCI B23
Sections: Monday, 3:35-4:25, CAS 201 (D1), 4:40-5:30, CAS 218 (D2)

Office hours: TBD, SCI 317, and by appointment

TF: TBD, Office hours: TBD
LA: David Simon (dsimon20@bu.edu), Office hours: TBD
Grader: TBD

Materials: The primary text is Basic Training in Mathematics: A Fitness Program for Science Students by R. Shankar (Springer).

Scientific programming will be taught through a series of interactive Jupyter notebook assignments which will be made available through the JupyterHub.

Lecture notes and material on computational aspects of the course will be posted on the schedule page.

Homework: There will be weekly written homework due Mondays in section. Computational homework, to be submitted electronically using the submission tool in the JupyterHub, will be due Mondays (at 11:59pm) as well. Late homework will lose 20% per day and will not be accepted more than two days late.

Exams: There will be two in-class midterms and a final. The *tentative* exam schedule:

Midterm 1	Thursday, March 5, in class, 12:30-1:45
Midterm 2	Thursday, April 9, in class, 12:30-1:45
Final	TBD

Grading: Homework 25%, Midterm 1 20%, Midterm 2 20%, Final 35%

Grades will be curved.

Tentative Syllabus/Schedule

The plan is subject to change as the course develops. This is the rough plan of topics:

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[Week 1-2]    Single Variable Calculus; Intro to Python
[Week 3-4]    Multi Variable Calculus
[Week 5-6]    Complex Variables and Functions
[Week 7-8]    Vector Calculus
[Week 9]      Matrices and Determinants
[Week 10-11]  Linear Spaces and Fourier Series
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[Week 12]      Eigenvalue problem
[Week 13-14]   Ordinary Differential Equations
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Students' responsibility

Students should know and understand the provisions of the CAS Academic Conduct Code and the BU Code of Student Responsibilities. Cases of suspected academic misconduct will be referred to the Dean's office.