

PY 501 Mathematical Physics

Syllabus

Fall Term 2020

Instructor: Claudio Rebbi

Office: PRB 551

Phone: 353-9058

e-mail: rebbi@bu.edu

Office hours: Weekly meetings will be held online at times to be set according to the students schedules.

Meetings can also be held by appointment.

Goals of the course:

The course is designed to provide the students with the understanding of several mathematical topics which play an important role in graduate physics courses.

Class meetings: MW 10:10AM-11:55AM. Classes will be held remotely and recorded.

Textbook: There is no mandatory textbook for this course.

Comprehensive lecture notes will be posted at

<http://physics.bu.edu/~rebbi>

The book “Mathematical Physics” by Eugene Butkov will be used as secondary source. The book is out of print, but a copy will be made available at the Mugar library.

Additional reference books are:

”Mathematical Physics” by Arfken, Weber, and Harris;

”Mathematical Methods of Physics” by Courant and Hilbert;

”Foundations of Mathematical Physics” by Sadri Hassani.

Tentative Schedule of Lectures

9-2	Introduction to the course
9-9	Review of vector calculus
9-14	Review of vector calculus
9-16	Functions of a complex variable
9-21	Functions of a complex variable
9-23	Functions of a complex variable
9-28	Functions of a complex variable
9-30	Functions of a complex variable
10-5	Make-up and Review
10-5/6	First midterm exam (take-home exam)
10-7	Linear differential equations of second order
10-12	no class - Columbus Day Holiday
10-13	(Substitute Monday schedule) Linear differential equations of second order
10-14	Linear differential equations of second order
10-19	Linear differential equations of second order
10-21	Non-linear ordinary differential equations, the Lotka-Volterra equation
10-26	Non-linear ordinary differential equations, the Van der Pol equation
10-28	The Fourier transform
11-2	The Fourier transform
11-4	The Laplace transform
11-9	Make-up and Review
11-9/10	Second midterm exam (take-home exam)
11-11	Differential equations with partial derivatives (PDEs): general considerations
11-16	Differential equations with partial derivatives in two dimensions
11-18	Elliptic, parabolic and hyperbolic PDEs
11-23	Characteristics of a PDE
11-25	no class - Thanksgiving recess
11-30	PDEs in higher dimensions
12-2	Special functions
12-7	Special functions
12-9	Make-up and Review

Note: Attendance at online lectures is mandatory, so long as the lecture time is compatible with the student's time zone. Students who cannot attend because of a time zone conflict can avail themselves of the recordings of the lectures and request online meetings at a mutually compatible time for follow-up explanations. Otherwise, students who cannot attend an online class should justify their absence by sending an email message, before the class they will miss if at all possible, to rebbi@bu.edu

Schedule of Exams

- 10-5/6 First midterm exam (take-home exam),
due on October 6 by the end of the day
- 11-9/10 Second midterm exam (take-home exam),
due on November 10 by the end of the day

The final exam will be held during the final exam period: December 15 to December 19

Homework assignments

Homeworks will be distributed weekly. Solutions to homework problems will be graded very generously, provided that they are returned by the due date.

Grading

At the end of the course the scores for homework assignments, midterm exams, and final exam will be averaged with a weight of 30% for homeworks, 20% for each midterm exam, 30% for the final exam, and the average score S will be converted to a letter grade as follows:

$94 \leq S \leq 100$:	A
$88 \leq S < 94$:	A-
$82 \leq S < 88$:	B+
$76 \leq S < 82$:	B
$70 \leq S < 76$:	B-
$64 \leq S < 70$:	C+
$58 \leq S < 64$:	C
$52 \leq S < 58$:	C-
$S < 52$:	F

These letter grades represent however minimum grades which students can expect solely for their results in homework and exams. Beyond homeworks and exams, students will be evaluated for motivation, participation to online meetings, special projects, and all those other factors which contribute to good course performance, and higher grades may awarded accordingly.

Graduate students should be aware that B- is the least passing grade for core graduate courses, which include PY 501.

Addendum

This addendum addresses further standard questions that students may have about the course.

1. Web site: syllabus, assignments, and other relevant material can be found at <http://physics.bu.edu/~rebbi>.
2. Late work: homework assignments must be returned by the deadline stated in the assignment. Extensions may be requested by sending an email message to the instructor only for very serious reasons (grave illness, etc...). Barring emergencies, the request for an extension must be sent before the deadline.
3. Independence of work: students should do their homework assignments by themselves.
4. Student's responsibility: Students should know and understand the provisions of the CAS Academic Conduct Code. (Copies are available in room CAS 105). Cases of suspected academic misconduct will be referred to the Dean's Office.

Relevant dates for the fall semester 2020 (from the 2020-21 Academic Calendar):

Classes Begin Tuesday, September 2

Labor Day Holiday, Classes Suspended Monday, September 7

Columbus Day Holiday, Classes Suspended Monday, October 12

Substitute Monday Schedule of Classes Tuesday, October 13

Thanksgiving Recess Wednesday, November 25 - Sunday, November 29

Last Day of Classes Thursday, December 10

Study Period Friday, December 11 - Monday, December 14

Final Exams Begin Tuesday, December 15

Final Exams End Saturday, December 19