**PY 501 Mathematical Physics**  
**Syllabus**  
**Fall Term 2021**

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**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, in room PSY B53.

**Textbook:** There is no mandatory textbook for this course.  
Comprehensive lecture notes are 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 is 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

9-8  Introduction to the course
9-13 Review of vector calculus
9-15 Review of vector calculus
9-20 Functions of a complex variable
9-22 Functions of a complex variable
9-27 Functions of a complex variable
9-29 Functions of a complex variable
10-4 Linear differential equations of second order
10-6 Linear differential equations of second order
10-11 no class - Indigenous Peoples’ Day
10-12 (Substitute Monday schedule) Linear differential equations of second order
10-13 Non-linear ordinary differential equations, the Lotka-Volterra equation
10-18 Non-linear ordinary differential equations, the Van der Pol equation
10-20 First midterm exam
10-25 The Fourier transform
10-27 Path integral formulation of quantum mechanics
11-1 Path integral formulation of quantum mechanics
11-3 The Laplace transform
11-8 Differential equations with partial derivatives (PDEs):
   general considerations
11-10 Differential equations with partial derivatives in two dimensions
11-15 Make-up and Review
11-17 Second midterm exam
11-22 Elliptic, parabolic and hyperbolic PDEs
11-24 no class - Thanksgiving recess
11-29 Characteristics of a PDE
12-1 PDEs in higher dimensions
12-6 Special functions
12-8 Make-up and Review
12-TBA Final exam (will be held during the final exam period: Dec. 14-18)
Schedule of Exams

10-20  First midterm exam.
11-17  Second midterm exam.

The final exam will be held during the final exam period: December 14 to 18.

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:

\[
\begin{align*}
94 \leq S &\leq 100: A \\
88 \leq S &< 94: A- \\
82 \leq S &< 88: B+ \\
76 \leq S &< 82: B \\
70 \leq S &< 76: B- \\
64 \leq S &< 70: C+ \\
58 \leq S &< 64: C \\
52 \leq S &< 58: C- \\
S &< 52: F
\end{align*}
\]

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, class participation, attendance to office hours, 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. Attendance at lectures is mandatory: students who cannot attend a lecture should send an email to the instructor, before the lecture if at all possible, to justify their absence. The accumulation of more than 3 unjustified absences may lead to a one-step reduction in the final grade (A→A-, A-→B+ etc.).

3. 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.

4. Independence of work: students should do their homework assignments by themselves.

5. 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 2021 (from the 2021-22 Academic Calendar):
Classes Begin Thursday, September 2
Labor Day Holiday, Classes Suspended Monday, September 6
Indigenous Peoples’ Day, Classes Suspended Monday, October 11
Substitute Monday Schedule of Classes Tuesday, October 12
Thanksgiving Recess Wednesday, November 24 - Sunday, November 28
Last Day of Classes Friday, December 10
Study Period Saturday, December 11 - Monday, December 13
Final Exams Begin Tuesday, December 14
Final Exams End Saturday, December 18