

PHYS 811 - Methods of Theoretical Physics I

Fall 2023

Instructor

Peisi Huang

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Office Hours: By appointment

Class Hours

MWF 10:30 am - 11:20 pm, JH 247

Textbooks

Required:

Arfken, Weber, and Harris, *Mathematical Methods for Physicists: A Comprehensive Guide 7th Edition*

Course Description

This course will cover fundamentals of applications of infinite series, vector analysis, tensor analysis, complex analysis, ordinary differential equations, special functions, and statistics (time permitted) to problems in theoretical physics with emphasis on special relativity, electrodynamics, quantum mechanics and quantum field theory.

Reading Assignments

Reading assignments will be posted on Canvas regularly. You can read it before or after the relevant lectures.

Problem-Solving sessions

We will have problem-solving sessions throughout the semester. The groups will be formed in the second week of the semester according to the pre-tests, and the groups will be rotated after the mid-term exam. Those sessions aim to go beyond homework problems to prepare you to solve more “real-world” problems that you may encounter in your research.

Exams

Midterm: 6:00pm-8:00pm 10/11 (tentative)

Final: 10:00am – noon, 12/15

Course Project

One important goal of this course is to understand how to apply mathematical methods to actual physics problems. The course project is an important component to help us to achieve this goal. The course project consists of an oral presentation on an application of the methods discussed in class. You can choose topics covered in another course, or your research project.

A project proposal (5% of the project grade) is due on Sep 25 through Canvas. You are encouraged to begin discussions with me about prospective topics well before that.

A project review (10% of the project grade), which includes a summary of the problem discussed and its connection to the course material (1-2 pages) is due Oct 30 through Canvas.

Class on Nov 15 will be reserved for peer discussion of drafts of the presentation. You will be divided into working groups.

Project will be presented in class on Nov 17 to Dec 6. Please submit your slides, together with a list of references used through Canvas before your presentation. The presentation will be 85% of the project grade. It will be from the peer evaluation, and the instructor will give up to 10% bonus points from participation.

Homework Assignments

Approximately 10 sets of homework will be assigned and will be due approximately one week later. The homework will be started in the group problem solving sessions and finished after class. You are collaborating with each other on homework during class time. However, each member of the group **MUST** write down his/her own solutions. You must state clearly how you do the calculations in your homework. Late homework submitted before the grader finish grading will be graded with a 50% penalty. Late homework submitted after that will not be accepted. The lowest score will be dropped.

Grading

30% Midterm exam

30% Final exam

20% Homework

20% Course Project

University-wide policies and Resources

See <http://go.unl.edu/coursepolicies> for information on University-Wide Course Policies and Resources.