

METHODS OF MATHEMATICAL PHYSICS (PHY 503) Fall 2025

Course title: Methods of Mathematical Physics I (PHY503)
Credit: 3 units
Semester: 2026 Fall
Instructor: Sergey Syritsyn (office C-140)
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Lectures: Soc.Behav.Sci N109; 28 lectures starting Aug 24, MoWe 11:00–12:20 PM
Office hours: In instructors' office (Physics C-140) or as announced; time/date TBA

Description and outline

The course is intended for students starting the graduate program who may need to take the core courses. The goal is to help students acquire skills in mathematical apparatus used in formalized Classical, Quantum, Statistical mechanics and E&M. The approximate outline of the course is

1. Functionals and variational calculus.
2. Linear algebra, vector spaces, and matrices.
3. Functional spaces and orthogonal polynomials.
4. Fourier transform and related questions.
5. Special functions
6. Ordinary differential equations and Green's functions.
7. Partial differential equations.
8. Complex-variable calculus and contour integrals.

The material will be presented in lectures, with some extra reading assignments. Homeworks will be assigned weekly, following discussion of similar sample problems in the class. Some of the related material may be presented exclusively in class.

Recitation

There is no official recitation scheduled for the class.

HOWEVER, there will be accompanying "Brown-bag math recitation" held on Wed 12:30-1:50pm in Physics P118 (tentative) open to all (graduate and undergraduate) students. Participation is highly encouraged, and the topics will be somewhat synchronized with the more in-depth discussion in the class lectures. Some problems from the recitation may be reassigned as homework for the class.

Main textbooks (recommended reading)

1. M. Stone, P. Goldbart, *"Mathematics for Physics"*.
2. K.F.Riley, M.P.Hobson, *"Mathematical Methods for Physics and Engineering: A Comprehensive Guide"*

Assessing performance (course score)

- Homeworks: 30% (anticipate 10 assignments requiring 3-6 hours weekly)
- Midterms 1 and 2: 20% + 20%
- Final exam: 30%

Grade determination

- $90\% \leq A-, A \leq 100\%$
- $75\% \leq B-, B, B+ < 90\%$
- $60\% \leq C, C+ < 75\%$
- $50\% \leq D < 60\%$
- $F < 50\%$

(The above are anticipated grade thresholds; these thresholds may be lowered or raised based on the difficulty of the midterm and final exams)

Homeworks

Homeworks will be posted weekly on Mondays (Brightspace), due in class one week after posting. Late submissions will be deducted 20% of the grade per day. Model solutions for select problems posted about five days after the due date. Discussions and group work are encouraged, but each student will be expected to provide *individually written solutions*; noticeable similarities *will result in reduced grades*.

Exams (All exams are closed-book)

- Midterm exams: (tentative) Oct 5 (Mon) and Nov 11 (Wed) in class
- Final: TBA

Student Accessibility Support Services (SASC):

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.
<https://www.stonybrook.edu/commcms/studentaffairs/sasc/facstaff/syllabus.php>

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at:
http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.