

PHYS 3P94: Mathematical Methods in Physics

Winter 2026

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office hours: by appointment

Brock calendar entry:

Techniques of mathematical physics in the context of physically relevant problems. Vector calculus in curvilinear coordinate systems, applied linear algebra, Fourier series and Fourier transforms, special functions of mathematical physics, and least-squares approximations.

Prerequisites: MATH 2P03, 2P08 and 2P96 or permission of the instructor.

Textbook:

There is no required textbook for the course. The main source of information will be the lecture notes.

Some suggested reading:

G. B. Arfken, H. J. Weber, and F. E. Harris, *Mathematical Methods for Physicists*, 7th edition (Academic Press, 2012); cost: \$73.25 at Amazon.ca

S. Hassani, *Mathematical Methods for Students of Physics and Related Fields*, 2nd edition (Springer, 2008); cost: \$129.95.

Tutorials:

Tutorial time slots will be used as problem sessions, as needed.

Marking scheme:

4 homework assignments: 15% each; **no fractional marks** will be awarded
assignments must be submitted online by 5pm (EST) on the due date
late assignments **will not be accepted**

final exam: 40%

you will need to pass the final exam to pass the course

Note: the final exam will be a **closed book** exam, with only a calculator
and one self-prepared formula sheet (letter size, two-sided) allowed.

Online resources:

can be accessed through Brightspace (<https://lms.brocku.ca>);
submission instructions for assignments can be found at
<https://www.physics.brocku.ca/Courses/Homework>

Academic integrity policy: <https://brocku.ca/academic-integrity>

Topics covered in the course:¹

- Vectors and vector spaces, matrices and determinants
- Vector calculus: gradient, divergence and curl, integral theorems
- Taylor and Fourier series, Fourier transform; Dirac delta-function
- Special functions I: Beta, Gamma, Digamma, and Error functions
- Equations of mathematical physics: Laplace, Poisson, Heat, Wave, and Schrödinger
- Special functions II: Orthogonal polynomials (Legendre, Hermite, and Laguerre), Bessel functions

¹This list is tentative. Some topics may be removed, while other topics may be added.
The examination will be only on the material actually covered in the lectures.