

PHYSICS 400
APPLICATIONS OF MATHEMATICS IN PHYSICAL SCIENCES
FALL 2025

Watanabe Hall 114, MWF 11:30am-12:20pm
Monday, August 25 – Friday, December 19
Last Day of Instruction: Thursday, December 11

Instructor

Dr. Chester Vause
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Office Hours: MWF, 12:30pm-1:30pm, or by appointment

Prerequisites

Math 244 or 253A, and Math 311 or 307

Textbook (Required)

Mathematical Methods for Physicists (7th edition), G. Arfken, H. Weber, and F. Harris
(Academic Press, 2013)

Textbook Chapters

Selected topics in textbook chapters:

3	Vector Analysis
2, 5, 6	Determinants and Matrices, Linear Algebra / Vector Spaces
1, 11	Calculus of Complex Variables
20	Integral Transforms
8, 12, 19	Sturm-Liouville Theory-Orthogonal Functions / Series
15, 18	Special Functions

Omitted sections in chapters may be announced as needed. Selected topics in other chapters may be included, time permitting.

Student Learning Outcomes

Among the student learning outcomes of this course are the abilities to:

- (a) Use complex variables, analytic function theory, and contour integration in the solution of mathematical problems applied to physics
- (b) Apply vector calculus in the formalism of physical theories
- (c) Formulate general linear equations in terms of matrix algebra and the eigenvalue problem as applied in physics
- (d) Understand the general mathematical formulation of orthogonal functions resulting from ordinary differential equations used in physics and the relationship to linear algebraic vector spaces

Homework Assignments

Suggested problems will be assigned. These will NOT be graded (see attached hand-out).

Exams

Exam instructions will be given on the exam cover page, Exams are closed-book, two student-generated notes, paper pages only (not electronic), per new exam material (2 pages for Exam 1, 4 pages for Exam 2, 6 pages for Exam 3, 8 pages for Final Exam), and scientific calculator, only. No internet devices (smartphones, pads, etc.) or electronic storage media. No other sources of material are allowed. By taking the exams, you consent to the conditions set forth.

Exam 1	Friday	September 26
Exam 2	Friday	October 24
Exam 3	Friday	November 21
Final Exam	Friday	December 19 12:00pm-2:00pm

Each Exam is based on material covered since the previous Exam. Each Exam is worth 1/4 of the final grade total score:

$$\text{TOTAL SCORE}(\%) = (1/4) * (\text{EX1}(\%) + \text{EX2}(\%) + \text{EX3}(\%) + \text{FNL}(\%))$$

Grade Scale

Letter grade is determined from the total score according to the following scale:

A- (86%-90%)	A (91%-95%)	A+ (96%-100%)
B- (61%-70%)	B (71%-80%)	B+ (81%-85%)
C- (31%-40%)	C (41%-50%)	C+ (51%-60%)
	F (0%-20%)	D (21%-30%)

NO INCOMPLETE GRADE GIVEN

NOTICE

The Instructor's course lectures and any of the Instructor's written materials (handouts, solutions, etc.) are the intellectual property of the Instructor, and are for your personal use only. It is not to be shared or distributed to anyone, in any form, in any media. No photography, no video, no audio, no electronic recordings of any kind.

Be prepared to take the exams on the assigned dates.*. This is not negotiable. If you have time conflicts, decide if this course is your first priority. I do not "work around" student's personal plans and schedules (work, travel and otherwise).

*(The Final Exam date is set by the University.)