

Course # 18611 (3 credits)

**Instructor:** Dr. Alan R. Denton, Professor      alan.denton@ndsu.edu  
 Dept. of Physics, NDSU                              office: SE 214B, NDSU

**Classes:** TuTh, 3:30-4:45 pm, SE 221      **Help:** on demand (in-person/Zoom)

**Bulletin Description:** This introductory graduate-level course reviews practical mathematical methods routinely used by physicists and applications to a variety of physical problems. The focus is on differential equations and variational principles. Depending on interests, other topics may be discussed. See schedule for a preliminary list of topics.

**Objectives:** Students will develop conceptual understanding and practical expertise in applying mathematical techniques to various physics- and engineering-related problems.

**Format:** Students are expected to review assigned resources in advance and attend class prepared to discuss and work through guided exercises. You are not expected to fully understand the material before class, but be familiar with terminology and definitions. In this way, class time can be used more effectively to deepen conceptual understanding, strengthen problem-solving skills, and discuss practical relevance and applications.

**Recommended Textbook:** K. F. Riley, M. P. Hobson, and S. J. Bence,  
*Mathematical Methods for Physics and Engineering*, 3rd edition (Cambridge, 2006).

**Inclusive Access:** To avoid charges, you must opt out before the Bookstore's deadline.

<b>Evaluation:</b>	Homework	100 pts	
	Exams	150 pts	(3 midterms and a final exam)
	Quizzes	50 pts	(reading and in-class)
	<u>Total</u>	<u>300 pts</u>	

Attendance is expected: NDSU Policy 333, [www.ndsu.edu/fileadmin/policy/333.pdf](http://www.ndsu.edu/fileadmin/policy/333.pdf)

Active engagement in class discussions is strongly correlated with success in this course!

**Homework:** Assignments will be posted on Blackboard (<https://bb.ndsu.nodak.edu>). Completed work must be handwritten and may be submitted on paper or via Blackboard. While discussion of homework with classmates is encouraged, submitted work must be your own. Close similarity to other students' or internet solutions will yield no points. Check your work with computational tools, but beware of risking your own understanding!

**Quizzes:** Reading quizzes and check-up quizzes will appear on Blackboard or in class.

**Grading:** A:  $\geq 90\%$ , B: 80 to  $< 90\%$ , C: 70 to  $< 80\%$ , D: 60 to  $< 70\%$ , F:  $< 60\%$   
 Grades will not be curved, and any shift in grade boundaries will act only in your favor.

### Health and Safety Expectations

Do not come to class if you are sick or, if infected by COVID-19, during your five-day isolation period. Do not come to class if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure. Requests for remote participation due to health concerns will be accommodated.

## Contingency Plan for Remote Instruction and Learning

Should any circumstances necessitate strictly online instruction, all course resources will remain accessible through Blackboard and communications and interactive discussions will continue via email and video conference (Zoom).

## Preliminary Schedule

Dates	Topic(s)	Chapter(s)
Week 1	Vector Calculus Review	10
Week 2	Line, Surface, and Volume Integrals	11
Week 3	Fourier Series	12
Week 4	Integral Transforms	13
Week 5	Ordinary Differential Equations	14
<b>February 8</b>	<b>Midterm Exam 1</b>	<b>10–13</b>
Week 6	Ordinary Differential Equations (ODEs)	15
Week 7	Series Solutions of ODEs	16
Week 8	Eigenfunction Methods for Differential Equations	17
March 4-8	Spring Break (no classes)	
Week 9	Partial Differential Equations (PDEs)	20
Week 10	PDEs: Separation of Variables, Green Functions	21
<b>March 21</b>	<b>Midterm Exam 2</b>	<b>14–17, 20</b>
Week 11	Calculus of Variations	22
Week 12	Calculus of Variations and Applications	22
Week 13	Tensors and Applications	26
Week 14	Numerical Methods	27
Week 15	Probability	30
<b>April 25</b>	<b>Midterm Exam 3</b>	<b>21, 22, 26, 27</b>
Week 16	Statistics	31
<b>May 7</b>	<b>Final Exam</b>	<b>10–27</b>

*The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at [www.ndsu.edu/academichonesty](http://www.ndsu.edu/academichonesty).*

*All access to NDSU computers must respect NDSU Senate Policy, section 158: Acceptable use of Electronic Communication Devices <http://www.ndsu.nodak.edu/policy/158.htm>*

*Any students with disabilities or other special needs, who need special accommodations in this course are invited to share concerns or requests with the instructor and to contact the Center for Accessibility and Disability Resources as soon as possible.*