

Course # 14709 (3 credits)

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Classes: TTh, 3:30-4:45 pm **Office hours:** MW, 4:00-4:45 pm (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 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).

Evaluation:	Homework	100 pts
	Exams	150 pts
	Quizzes	50 pts
	<u>Total</u>	<u>300 pts</u>

Attendance is expected (NDSU Policy 333, www.ndsu.edu/fileadmin/policy/333.pdf), but face masks and physical distancing (2 m separation) are required in the classroom. Note: *Requests for remote participation will be accommodated through video conferencing.* 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>). 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.

Quizzes: Reading quizzes and check-up quizzes will be posted on Blackboard.

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 be only in your favor.

Contingency Plan for Remote Instruction and Learning

Requests for remote participation due to concerns over COVID-19 will be accommodated. See attached COVID-19 Related Information.

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 (e.g., Zoom, Blackboard Collaborate Ultra).

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
February 11	Midterm Exam 1	10–13
Week 6	Ordinary Differential Equations (ODEs)	15
Week 7	Series Solutions of ODEs	16
Week 8	Eigenfunction Methods for Differential Equations	17
Week 9	Partial Differential Equations (PDEs)	20
March 15-19	Spring Break (no classes)	
Week 10	PDEs: Separation of Variables, Green Functions	21
March 25	Midterm Exam 2	14–17, 20
Week 11	Calculus of Variations	22
Week 12	Calculus of Variations and Applications	22
Week 13	Integral Equations and Applications	23
Week 14	Complex Variables and Applications	24, 25
Week 15	Tensors and Applications	26
April 29	Midterm Exam 3	21–25
Week 16	Group Theory	28
May 11	Final Exam	10–28

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.

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 Disability Services Office as soon as possible.

Failure to follow NDSU guidelines will result in referral to the Dean of Students Office or administrative removal from class. Students who cannot wear a face covering due to a medical condition or disability may seek accommodation through Disability Services:

701-231-8463 <https://www.ndsu.edu/disabilityservices/>

Disinfecting supplies are provided for you to disinfect your learning space. You may also use your own disinfecting supplies.

Whenever possible, observe physical distancing guidelines, maintaining 2 m separation from others. Avoid congregating around the classroom entrance before or after class.

In accordance with NDSU [Policy 601](#), failure to comply with instructions, including this syllabus, may be handled according to the Code of Student Conduct resolution process and may result in disciplinary sanctions.

Food and drink are not allowed in class except with a documented accommodation through Disability Services (since consumption obviously requires removing your mask).

Do not come to class if you are sick. Please protect your health and the health of others by staying home, where you may participate remotely. For information on COVID-19, symptoms, testing, and steps to stay healthy see

https://www.ndsu.edu/studenthealthservice/covid_19/

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.

If you are unable to attend class at the scheduled time due to illness or exposure, contact me for alternate arrangements, including accommodations and extensions.

If you are absent from class as a result of a COVID-19 diagnosis or quarantine, the decision for approval of all absences and missed work is determined by the course instructor. As instructor, I will do the following to help you make progress in the course:

You will be able to participate in class remotely.

You will be able to submit assignments and take exams remotely.

Other remote learning options will be determined on a case-by-case basis.

HyFlex Options

Resource for students on HyFlex instruction, compiled by IT: <https://kb.ndsu.edu/learn>

If you are at high risk of contracting COVID-19 (or of infecting someone at high risk), you have the option of attending classes remotely via Zoom. You may opt to do so at the beginning of the semester or as the need arises during the semester.

To participate in HyFlex instruction remotely, you must have access to the requisite technology, including a laptop or computer with a functioning microphone, speakers (or headphones) and webcam, as well as reliable internet access.

To opt for the remote learning experience in this course, inform the instructor via email as soon as possible.

Additional Resources for Students

As a valued member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today:

Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>

Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>

Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>

Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a crisis or emergency situation:

Call University Police: 701-231-8998

Call 9-1-1

Go to a Hospital Emergency Room

Go to Prairie St. John's for a Needs Assessment: 701-476-7216 (510 4th St. S, Fargo)

Call the FirstLink Help Line: 1-800-273-TALK (8255) or 2-1-1

Call the Rape and Abuse Crisis Center: 701-293-7273