PHY250   Applied Mathematics for Scientists and Engineers
Gustavus Adolphus College, Fall 2021

Dr. Tom Huber (he/him)
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Office Hours: https://rebrand.ly/huber_schedule

Textbooks:
Mathematical Methods for Engineers and Physicists, by Gary Felder and Kenny Felder, ©2015
Mathematical Handbook of Formulas and Tables, by Murray R. Spiegel (Schaum's Outline Series)

Course Description and Objectives:
An introduction to the mathematics used by scientists and engineers including topics in multivariable calculus, Fourier series, solutions to differential equations, special functions, linear equations, vectors, matrices and determinants, and coordinate transformations. Another emphasis will include numerical solutions of problems using Mathematica and MATLAB. Emphasis will be placed on the mathematics needed to describe physical systems.

Course Policy and Evaluation:
1. **Class Meetings and Reading Assignments**: The class will meet MTWRF at 10:30-11:20. Daily reading assignments will be listed in Moodle; these should be read before class starts. Due to the pace of this course, lectures will not cover all of the material in the reading. The purpose of the lectures will be to explain and clarify the book, to give examples, to practice, and to answer your questions. Occasionally, material in lectures will be in addition to what is in the textbook. You are responsible for all of the material covered by both the readings and lectures.

2. **Prerequisite Mathematics:** Students in PHY250 are expected to have a solid background and have passed Calculus I and Calculus II with a grade of C or better. Material from these courses will be used frequently in PHY250 including in homework and exam problems.

3. **Ask for Help:** If you have trouble with any aspect of the course, make sure you let me know as early as possible. By being proactive in reaching out for assistance, I can better help you identify strategies for success. If you have any questions about assignment values, attendance, or other course components that are part of course grades, please contact me before the close of the semester grading period. I will have office hours and welcome the opportunity to talk with you at other times by appointment. For my schedule, see https://rebrand.ly/huber_schedule

4. **COVID Policies**: We will follow the most up-to-date COVID policy of the college with regard to masking, social distance, food and beverage in the classroom, and sanitizing of technology and spaces. Students will be warned if they are violating these policies, such as not wearing a mask. Students who repeatedly disregard these policies may receive a reduction of the final course grade.

5. **Course Communication:** Students are expected to check their Gustavus email at least once every day to ensure that they receive email messages from their instructor. Assignments and additional resources will be posted on the course Moodle site.

6. **Homework**: Homework problems will be assigned according to chapters in the textbook. The due dates for these assignments are listed in Moodle. ***All assignments must be submitted as a single easily readable PDF file into Moodle; other file formats will be accepted at the discretion of the instructor.***

Homework sets should be neat and organized, with the problems appearing in the order assigned. Each student will submit their own assignment, but you are encouraged to discuss and work problems with each other, and your instructor. Copying of homework from classmate **_or any other source_** is considered a violation of the academic honor code.

7. **Late Homework:** Late homework will be accepted at the discretion of the instructor with loss of points. No homework will be accepted after the problems have been returned to the class or the solutions posted.

8. **Discovery Exercises**: Most sections of the text have short "Discovery Exercises" or "Motivating Exercises". These will be frequently assigned to be completed, in small groups, prior to the start of class.

9. **Group Problems**: Frequently in class, students will work together, in assigned groups of 2-3 members, to cooperatively solve problems. A group solution will be submitted, with all group members receiving the same grade. There will be no make-up for group problems missed due to absence.

10. **Attendance**: Students are expected to attend all class sessions as listed on the course calendar, including online synchronous sessions, are responsible for all announcements and assignments made during class. Students who are required to self-quarantine due to COVID-19 or as the result of a SARS-CoV contact trace are not required to inform the instructor of their reason for missing in-person classes, but should contact the instructor via email giving the duration of their absence. These students will be provided with options that will allow them to be counted as participating remotely. Quarantined students who remain active and on track in an existing online class component (for example, Moodle activities) will be considered as "in attendance" (see participation policy for how this activity will be recorded by the instructor). Students will be held responsible for informing themselves of all announcements/assignments made in class. Students who have course conflicts, particularly for other college sponsored co-curricular activities, should present their instructor with a written list of dates.

11. **Exams:** There will be four hour-exams and a two-hour final. Students must arrange **in advance** to take an exam at other than the scheduled time, and may do so **only** for a valid health or school-related reason. (***It is the responsibility of the student to inform the instructor during the first week of the semester regarding any anticipated absences due to required field trips, athletic events, musical performances, or other extra-curricular activities.***) Exams missed without pre-arrangement are entered as zero credit and cannot be made up.

12. **Homework Help/Tutoring:** The physics department has tutors available on Sunday through Thursday evenings. If you need assistance, please visit your instructor during office hours or contact him to schedule other times to meet.

    Preliminary Exam Schedule (Subject to change)
    Friday, Oct. 1, 2021: Test 1
    Friday, Oct. 22, 2021: Test2
    Wednesday, Nov 17, 2021: Test 3
    Friday, Dec. 10, 2021: Test 4
    Monday, Dec. 20, 2021 at 1:00: Final Exam

Evaluation: Assignment of final letter grades will be based upon the following guidelines:

Homework	25%
Group/Discovery Problems	15%
Hour Exams	40% (Lowest exam scaled as 1/2)
Final Exam	20%

	B+ = 86-90%	C+ = 74-78%	D+ = 62-66%
A = 94-100%	B = 82-86%	C = 70-74%	D = 58-62%
A- = 90-94%	B- = 78-82%	C- = 66-70%	

Assignment of final letter grades will also take into account the instructor's subjective evaluation of the student's attendance, initiative, preparation (particularly quantity and quality of homework), and evidence of improvement.

13. **Incompletes:** A grade of incomplete may be awarded at the discretion of the instructor, if requested by the student, under the following conditions: 1) the last day to withdraw has passed, 2) and unforeseen circumstances beyond the student's control (usually restricted to illness or family emergency) preclude completion of the remaining work for the course by the semester deadline. Note that poor planning or having a lot of work to complete at the end of the term are not, in fairness to other students, considered circumstances beyond a student's control. This additional time to complete coursework may not extend beyond the final day of the following semester, and earlier limits may be set at the discretion of the instructor.

14. **Academic Honesty:** Having signed and agreed to abide by the College's Honor Code, students thereby pledge that, in all academic exercises, examinations, papers, and reports, they shall submit their own work. Footnotes, or some other acceptable form of citation must accompany any use of another's words or ideas. In the context of this course, students are encouraged to collaborate and to discuss their out-of-class assignments. However, submitting under one's own name work that is merely copied from another is a violation of the Honor Code. The sanction in this course for a violation of the Honor Code involving plagiarism, copying another student on an exam, or other kinds of cheating on a single assignment will usually be an "F" on the plagiarized assignment or exam. For a more significant event, your Professor reserves the right to assign you a grade of "F" for the course. In addition, for any Honor Code violation, your Professor will notify the Provost's Office. A letter will be generated by the Provost's Office and sent to you. The letter will remain on file. Full descriptions of the Academic Honesty Policy and the Honor Code can be found in the Academic Catalog, online at https://gustavus.edu/general_catalog/current/acainfo. For more information about the Honor Code, contact Dean Valerie Banschbach (vbanschbach@gustavus.edu or x7541).

15. **Academic Accommodations:** Gustavus Adolphus College is committed to ensuring equitable and inclusive learning environments for all students. If you have a disability and anticipate or experience barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. When appropriate, staff will guide students and professors in making accommodations to ensure equal access. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact them as early as possible. Accessibility resources staff are located in the Academic Support Center (https://gustavus.edu/asc/accessibility/) (x7227). Accessibility Resources Coordinator, Corrie Odland (codland@gustavus.edu), can provide

further information.

16. **Multilingual Student Support:** Some Gusties may have grown up speaking a language (or languages) other than English at home. If so, we refer to you as "multilingual." Your multilingual background is an incredible resource for you, and for our campus, but it can come with some challenges. You can find support through the Center for International and Cultural Education's (https://gustavus.edu/cice/) Multilingual and Intercultural Program Coordinator (MIPC), Pamela Pearson (ppearson@gustavus.edu). Pamela can meet individually for tutoring in writing, consulting about specific assignments, and helping students connect with the College's support systems. If you want help with a specific task (for example, reading word problems on an exam quickly enough or revising grammar in essays), let your professor and Pamela know as soon as possible. In addition, the Writing Center (https://gustavus.edu/writingcenter/) offers tutoring from peers (some of whom are themselves multilingual) who can help you do your best writing.

17. **Mental Wellbeing:** The Gustavus community is committed to and cares about all students. Strained relationships, increased anxiety, alcohol or drug problems, feeling down, difficulty concentrating, and/or lack of motivation may affect a student's academic performance or reduce a student's ability to participate in daily activities. If you or someone you know expresses such mental health concerns or experiences a stressful event that can create barriers to learning, Gustavus services are available to assist you, and include online options. You can learn more about the broad range of confidential health services available on campus at https://gustavus.edu/counseling/ and https://gustavus.edu/deanofstudents/services/.

18. **Research Assistance:** Students can always get help with research at the library. Reference librarians will help find information on a topic, develop search strategies for papers and projects, search library catalogs and databases, and provide assistance at every step. Drop-ins and appointments are both welcome. Visit https://gustavus.edu/library/reference_question.php for hours, location, and more information.

19. **Title IX: Sexual Misconduct Prevention and Resources:** Gustavus Adolphus College recognizes the dignity of all individuals and promotes respect for all people. As such, we are committed to providing an environment free of all forms of discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available; you can learn more online at https://gustavus.edu/titleix/.

Please know that if you choose to confide in me, I am required by the College to report to the Title IX Coordinator, because Gustavus and I want to be sure you are connected with all the support the College can offer. Although it is encouraged, you are not required to respond to outreach from the College if you do not want to. You may speak to someone confidentially by contacting the Sexual Assault Response Team (SART/CADA), Chaplains, Counseling Center, or Health Service staff; conversations with these individuals can be kept strictly confidential. SART/CADA can be reached 24 hours a day at 507-933-6868. You can also make a report yourself, including an anonymous report, through the form at https://gustavus.edu/titleix/.

Material Covered

Chapter 1: Introduction to Ordinary Differential Equations
Chapter 4: Partial Derivatives
Chapter 5: Integrals in Two or More Dimensions
Chapter 8: Vector Calculus
Chapter 2: Taylor Series and Series Convergence
Chapter 3: Complex Numbers
Chapter 6: Linear Algebra I
Chapter 7: Linear Algebra II
Chapter 9: Fourier Series and Transforms
Chapter 10: Methods of Solving Ordinary Differential Equations

If time permits:
Chapter 11: Partial Differential Equations
Chapter 12: Special Functions and ODE Series Solutions
Chapter 13: Calculus with Complex Numbers