

**Class Time and Place:**

2210–001, MWF, 9:40–10:30, GC 2900

2210–002, MWF, 10:45–11:35, GC 2900

**Instructor:** Ken Golden, Distinguished Professor of Mathematics, Adjunct Professor of Biomedical Engineering, LCB 328, 801-750-8555 (mobile), 801-581-6176 (office)  
golden@math.utah.edu, kenatmath@gmail.com  
website: [www.math.utah.edu/~golden](http://www.math.utah.edu/~golden)

**Course Credit Information:** Math 2210 Calculus III is a 3 credit course.

**Prerequisite Information:** “C” or better in (MATH 1220 OR MATH 1250 OR MATH 1320) OR AP Calculus BC score of at least 4.

**CLASS FORMAT:** Mathematics 2210 Sections 1 and 2 will be taught in person. Professor Golden will give lectures in our classroom and write the notes on a tablet during the class times above. The notes will be displayed on the giant screen at the front of the room, and saved as PDF files which will be posted on Canvas. Each day during section 2, Professor Golden will be recorded by a TLT videographer at the back of the room. A recording of each lecture will be posted on Canvas. The material covered in section 2 will be very similar to that in section 1 and will include all relevant information for the course. Attendance, as well as class participation, is strongly encouraged.

**NOTE:** You will need access to a stable internet connection to complete the class homework assignments in the WeBWorK system. Also, while unlikely, if our circumstances change, we may need to be prepared to switch over to having class on zoom, hopefully only for a short period of time. Ideally, each student will have access to a laptop or tablet with a good internet connection. Let the TAs know if you need any assistance in securing these items.

**Instructor Office Hours:** Professor Golden will hold one in-person office hour each week, and one zoom office hour each week. Times and locations will be announced in class and posted on Canvas when classes start, but are subject to change. The instructor is also available at other times by appointment.

**Text:** *Calculus with Differential Equations, 9th Edition*, Varberg, Purcell and Rigdon  
For information on purchasing the textbook: [www.math.utah.edu/schedule/bookInfo/](http://www.math.utah.edu/schedule/bookInfo/)

**Course Materials:** Practice exams and their solutions, the syllabus, help schedules, extra resources and interesting items on calculus, science, etc. will be available on Canvas.

**Course Description:** Mathematics 2210 is an introduction to multivariable calculus. Vectors, functions, and motion in two and three dimensional space will be examined. Derivatives and integrals of functions of many variables will be developed. The fundamental differential operators of calculus in higher dimensions, **div**, **grad**, and **curl**, and their physical interpretations for fluid and electromagnetic fields, will be studied in detail. Integration of functions on curves, surfaces, and volumes will be developed. The course will conclude with an introduction to vector field theory and the theorems of Green, Gauss, and Stokes.

### Teaching Assistants (TAs):

**Delaney Mosier**, delaney@math.utah.edu (Standard Email), delaney.mosier@gmail.com (Email for Urgent Issues), 719-355-4551 (Cell Number for Emergencies).

**Nash Ward**, u1313735@utah.edu, 385-539-4009 (Cell Number for Emergencies).

### Discussion Hours:

There will be optional discussion sessions conducted by the TAs. During these sessions you can get help with WeBWork problems, exams, etc. The schedule of times and locations will be posted on Canvas.

### Getting Help:

- **Using WeBWork:** You will access the WeBWork system through your Canvas login. In class we will briefly go over how the WeBWork system works. If you encounter any problems, please contact TA Delaney Mosier, and give your full name, course number and section, and student ID number.
- **WeBWork Feedback Button:** When you use the feedback button within an exercise, **please state your question clearly**. All relevant data about your question and answer attempts are sent to your TA. Please use this very helpful tool as needed, but don't over-use it, the TAs will be getting lots of emails.
- **Tutoring Center & Computer Lab:** There is free tutoring in the T. Benny Rushing Mathematics Student Center (Room 155, the lower level between JWB and LCB), as well as a computer lab. For more information see <https://www.math.utah.edu/undergraduate/mathcenter.php>
- **Private Tutoring:** University Tutoring Services, 330 SSB. There is also a list of tutors in the math department office JWB 233.
- **Departmental Videos:** The math department has a full set of excellent lecture videos which you are welcome to use to supplement our course material. These can be found at <http://www.math.utah.edu/lectures/>

### Grades and Exams:

- (60%) Your two best scores on three in-class midterm exams taken during your class time. The lowest of your three exam scores is dropped automatically in calculating the final grades. There are NO MAKE-UP EXAMS. You may have one sheet of notes (front and back) and a calculator during any exam, but there is to be NO communication with anyone during the exam except possibly the TAs.
- (20%) Final exam.
- (20%) WeBWork assignments.

- **Path to success in this class.** **1.** Complete your WeBWorK assignments – you can try as many times as is needed in answering any question, and get as much help as you need, so you should be able to get most of the points on every assignment. **2.** Prepare for and actively participate in the lectures. **3.** Take the practice exams seriously: know how to solve the problems there, as well as problems like them. Make sure you attend Professor Golden’s review session before each exam. He will solve all the problems on the practice exam and answer any questions relevant to the real exam. **4.** There are 3 dedicated people (Ken, Delaney, Nash) who really care, and who are there to help you, answer your questions, and help facilitate your success. Please use these valuable resources, that’s what we’re here for!

### Student Integrity Policy:

- We expect that you will take exams honestly. We expect that you will submit your own work; exams should be taken independently, and without finding answers online.

### Course Outline:

August	23-27	11.1-11.3	Vectors and the geometry of space	
	30-3	11.4-11.7	Motion and vector-valued functions	
September	7-10	11.8-11.9	Surfaces; coordinate systems	
	13-17	12.1-12.4	Derivatives of multivariable functions	
	20-24	12.5-12.6	Directional derivatives and the gradient	EXAM I (Sept. 24)
October	27-1	12.7-12.9	Tangent planes; maxima and minima	
	4-8	13.1-13.3	Double integrals	
	11-15		FALL BREAK	
	18-22	13.4-13.6	Surface area; applications	
	25-29	13.7-13.8	Triple integrals	EXAM II (Oct. 29)
November	1-5	13.9	Change of variables in multiple integrals	
	8-12	14.1-14.2	Vector fields and line integrals	
	15-19	14.3-14.4	Green’s Theorem and path independence	EXAM III (Nov. 19)
	22-24	14.5-14.6	Gauss’s Theorem and surface integrals	
	29-3	14.7	Stokes’s Theorem	
December	6-8		Partial differential equations of science	
	13-17			FINAL EXAMS

### FINAL EXAM SCHEDULE:

2210-001: Monday, December 13, 8:00 AM – 10:00 AM, GC 2900

2210-002: Wednesday, December 15, 10:30 AM – 12:30 PM, GC 2900

**Expected Learning Outcomes:** Upon successful completion of this course, a student should be able to:

1. Perform basic vector computations, as well as dot and cross products of two vectors and projection of one vector onto another vector.
2. Convert between cylindrical, rectangular and spherical coordinates. Understand when it's prudent to switch to one coordinate system over another in computing an integral.
3. Determine the equation of a plane in 3-d, including a tangent plane to a surface in 3-d.
4. Find the parametric equations of a line in 3-d.
5. Perform calculus operations on functions of several variables, including limits, partial derivatives, directional derivatives, and gradients; understand what the gradient means geometrically.
6. Find maxima and minima of a function of two variables; use Lagrange Multipliers for constrained optimization problems.
7. Understand divergence and curl of a vector field.
8. Compute double and triple integrals in rectangular, spherical and cylindrical coordinates; proper use of double or triple integrals for finding surface area or volume of a 3-d region.
9. Compute line and surface integrals.
10. Determine if a vector field is conservative and if so, find the corresponding potential function.
11. Use and understand when to apply Green's Theorem, Gauss' Divergence Theorem and Stokes Theorem.

**COVID-19 Policies and Protections:**

University leadership has urged all faculty, students, and staff to model the vaccination, testing, and masking behaviors we want to see in our campus community. These include vaccination, masking indoors, and getting weekly asymptomatic coronavirus testing if unvaccinated.

- Get a COVID-19 vaccination if you have not already done so. Vaccination is proving highly effective in preventing severe COVID-19 symptoms, hospitalization, and death from coronavirus. Vaccination is the single best way to stop this COVID resurgence in its tracks.
  - Many in the campus community already have gotten vaccinated, including more than 80% of U. employees and over 70% of U. students
  - Visit <http://mychart.med.utah.edu/>, <http://alert.utah.edu/covid/vaccine>, or <http://vaccines.gov/> to schedule your vaccination.

- While masks are no longer required outside of Health Sciences facilities, UTA buses, and campus shuttles, CDC guidelines now call for everyone to wear face masks indoors.
  - Check the CDC website periodically for masking updates—  
[www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinatedguidance.html](http://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinatedguidance.html)
  - Treat masks like seasonal clothing (i.e., during community surges in COVID transmission, masks are strongly encouraged indoors and in close groups outside).
- If you are not yet vaccinated, get weekly asymptomatic coronavirus tests. This is a helpful way to protect yourself and those around you because asymptomatic individuals can unknowingly spread the coronavirus to others.

Asymptomatic testing centers are open and convenient:

- Online scheduling
- Saliva test (no nasal swabs)
- Free to all students returning to campus (required for students in University housing)
- Results often within 24 hours

Visit [alert.utah.edu/covid/testing](http://alert.utah.edu/covid/testing) for more information.

- **Remember:** Students must self-report if they test positive for COVID-19 via <https://coronavirus.utah.edu/>. We also encourage you to inform Ken and/or Delaney of your illness so that we may accommodate your needs and keep everyone safe and healthy.
- Given the nature of this course, attendance is required and adjustments cannot be granted to allow non-attendance. However, if you need to seek an ADA accommodation to request an exception to this attendance policy due to a disability, please contact the Center for Disability and Access (CDA). CDA will work with us to determine what, if any, ADA accommodations are reasonable and appropriate.
- Take care of your mental health! Rates of burnout, anxiety, depression, isolation, and loneliness have noticeably increased during the pandemic. If you need help, reach out for campus mental health resources, including counseling, trainings and other support. Consider participating in a Mental Health First Aid or other wellness-themed training provided by our Center for Student Wellness and sharing these opportunities with your peers, teaching assistants and department colleagues.

You can access important resources via

<https://studentaffairs.utah.edu/mental-health-resources/index.php>.

**Student Responsibilities:** All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code

carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, and I will do so, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. <http://regulations.utah.edu/academics/6-400.php>

**ADA Statement:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

**Addressing Sexual Misconduct:** Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

**Student Names and Personal Pronouns:** Class rosters are provided to the instructor with the student's legal name as well as 'Preferred first name' (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, group projects, etc. Please advise me of any name or pronoun changes (and update CIS) so I can help create a learning environment in which you, your name, and your pronoun will be respected. If you need assistance getting your preferred name on your UIDcard, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email [bpeacock@sa.utah.edu](mailto:bpeacock@sa.utah.edu) to schedule a time to drop by. The LGBT Resource Center hours are M-F 8am-5pm, and 8am-6pm on Tuesdays.

**Wellness Statement:** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at [www.wellness.utah.edu](http://www.wellness.utah.edu) or 801-581-7776.

**Safety Statement:** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit [safeu.utah.edu](http://safeu.utah.edu).

**Teaching Team Contact Information:**

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