Math 2310-002
Vector Calculus for Engineers
Spring 2022

INSTRUCTOR INFORMATION

• Jingyi Zhu
• Email: zhu@math.utah.edu
• Office: LCB 335
• Phone: (801) 581-3236
• Office Hours in-person and on Zoom: MW 1:00 - 2:30 pm, F 9:30 - 11:00 am, or by appointment.

COURSE DESCRIPTION

Engineering Mathematics Sequence: This is part of the accelerated/honor track.

Prerequisites:

• “C” or better in either Math 2250 or 2280 AND any of the following
  – Math 1320, Math 2210, Math 1321, Math 1280.

• Departmental consent

Course Credit Hours: 1

COURSE DETAILS

Course Type: In-Person

Location and Meeting Times: WEB L114, MTuWF 10:45 - 11:35 am

Attendance and Punctuality: All students are required to attend classes and attendance will be taken at the beginning of each class. However, each student is allowed up to four instances of no-attendance for the semester with no explanation required. If there is a situation involving someone being quarantined or self-isolated due to COVID-19, or ADA accommodations, or if you need to make an exception
in order to attend other university activities or for medical and/or other emergency reasons, please contact me and obtain an agreement in writing. Be considerate to other students in the class by attending classes on time.

**Instructional Support Team:** A grader will be assigned within the first two weeks of the semester and he/she will be grading weekly homework assignments in the Gradescope system. If there is any error in homework grading, please contact me directly and I will resolve the issues in a timely manner.

**Course Materials:** All materials for this course are copyrighted. Do not distribute or share course resources without instructor permission.


  The e-textbooks are viewable in Canvas and you will be automatically OPTED IN to be charged for the text. **Unfortunately the fee is not included in course tuition and you will need to choose to OPT OUT if you obtain the text through other means.**

- **Additional course materials:** Lecture notes will be posted online in the Canvas system for all registered students according to the schedule below. In addition, I will supply homework solution notes, review materials, sample exam problems and solutions following the schedule in this syllabus.

**Technical Requirements:**

- **Canvas:** Students are expected to be computer literate and Canvas skills are expected. For technical assistance, please review the Canvas Getting Started Guide for Students or contact TLT.

- **Matlab:** A Matlab license is helpful but not required for this course.

- **Loaning laptops:** The Marriott Library is loaning laptops to students who need a laptop for classes. For information, please visit [https://lib.utah.edu/coronavirus/checkout-equipment.php](https://lib.utah.edu/coronavirus/checkout-equipment.php)

**Syllabus subject to change:** This syllabus is meant to serve as an outline and guide for our course. Please note that with unforeseen development I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas.

**CONTENT OVERVIEW**

The goal of Math 2310 is to master the basic tools of calculus in 2 and 3 dimensions, especially the major vector calculus theorems (Green’s, Stokes, and divergence) that are fundamental to mathematical modeling in physical sciences.
COURSE EXPECTED LEARNING OUTCOMES

• Students will be introduced to the tools of integration of multivariate functions over areas and volumes and will learn the use of iterated multiple integration. Similar to single-variable integration, students will learn the technique of multidimensional change-of-variables to transform the coordinates over which integration proceeds by utilizing the Jacobian. Specifically, students will learn how to transform between an integral over an area or volume in Cartesian coordinates to polar or spherical coordinates, respectively.

• Students will become familiar with vector functions that define vector fields in the plane and 3D space, particularly conservative vector fields, represented by the gradient of a scalar function, which are important for gravitation and electrostatics. When masses or charged particles are pushed through fields such as these along curved paths, the work done can be computed as a line integral. Students will learn how the fundamental theorem for line integrals for conservative vector fields reduces the integral to valuation of the potential at the endpoints of the path.

• Students will learn the fundamental vector calculus integral theorems of Green, Stokes, and divergence. The notion that one-dimensional integrals of functions can be computed from evaluation of a related function (e.g., an antiderivative or a potential function) on the end-points of the interval of integration generalizes to integration over areas, surfaces and 3D domains. Integration over these domains can be computed by evaluation on the boundary of an area, surface, or volume of the appropriate function. Students will learn meaning and computation of the curl and divergence of a vector field and utilize them to compute area and volume integrals using Green’s and Stokes’, and the divergence theorems, respectively. Students will also learn how these theorems represent conservation principles for physical vector fields important in gravitation and electric fields.

COURSE DESIGN

Weekly lecture notes will be posted on Canvas each Monday and you are expected to come to class with questions related to the materials in the notes. A 10-minute quiz is given each Friday towards the end of the class to capture the understanding of the materials from the previous week, while a list of questions will be posted by the weekend before to prepare you for the quiz on Friday. If possible, we will form small groups to sketch and solve as many problems as possible, and return home to finish the details.
CLASS SCHEDULE and IMPORTANT DATES

Exam Dates:

- Weekly quizzes: Each Friday at the end of class (11:25 - 11:35 am), except these weeks with a midterm exam scheduled on Monday of the week.
- Final exam: Monday, February 14, 10:45 - 11:35 am.

Official Drop/Withdraw Dates: Last day to register without a permission code is Friday, January 14. Last day to drop class, or elect CR/NC options is Friday, January 21. Please check the academic calendar for more information pertaining to dropping and withdrawing from a course. Withdrawing from a course and other matters of registration are the student’s responsibility.

Holidays: There will be no class on Monday, January 17 (Martin Luther King Day).

COURSE SCHEDULE

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<thead>
<tr>
<th>Date</th>
<th>Section</th>
<th>Topics</th>
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<tbody>
<tr>
<td>Jan 10 - 14</td>
<td>12.6-7</td>
<td>Surface area, triple integrals</td>
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<tr>
<td>Jan 18 - 21</td>
<td>12.8-9, 13.1</td>
<td>Cylindrical and spherical coordinate integrals, Jacobian, vector fields</td>
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<tr>
<td>Jan 24 - 28</td>
<td>13.2-3</td>
<td>Line integrals, fundamental theorem of line integrals</td>
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<tr>
<td>Jan 31 - Feb 4</td>
<td>13.4-5</td>
<td>Green’s theorem, curl and divergence</td>
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<tr>
<td>Feb 7 - 11</td>
<td>13.6-8</td>
<td>Surface flux integrals, Stokes’ theorem, divergence theorem</td>
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<tr>
<td>Feb 14</td>
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<td>Final Exam</td>
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COMMUNICATION

- All course materials, such as lecture slides, assignments, solutions, grades, etc. will be posted on the Course Canvas site: [https://utah.instructure.com/courses/773973](https://utah.instructure.com/courses/773973)

Class announcements will be done via email through the Canvas server. You will be responsible for any information contained in them as well as the information announced in class.

- It is your responsibility to also regularly check your Umail (make sure you set up forwarding if you do not check it regularly), your Umail is the only way for me to communicate privately with you, there will be occasions during the
semester that we may need to reach out to you individually (e.g. regarding a grade or assignment) and it is in your best interest to respond promptly.

- Feel free to contact me by email for questions at zhu@math.utah.edu. I will do my best to answer emails promptly. I would like to encourage you to email me only if it is something personal that requires individual attention, if instead you have questions about logistics of the class, course material and assignments, and anything else your classmates may wonder as well, please post a question on the Canvas Discussions Board instead. This way the information is shared quickly to the entire class, and each of you can benefit from seeing other classmates questions.

- I will always do my best to ensure the communication relevant to the course is clear and transparent, it is your responsibility as well to keep yourself updated by regularly checking: the announcements on Canvas, your Umail, the posts on the Discussions Board, and pay attention to the announcements given in class and Discussion Section.

- Course Canvas Page: You are expected to log in and check Canvas everyday for posted announcements and assignments, and you are also strongly advised to set up notifications for Canvas so you do not miss any important notifications.

ASSIGNMENTS, ASSESSMENT AND GRADING

The course grade will be based on weekly homework assignments (40%), weekly quizzes (20%), and a final comprehensive exam (40%).

- Homework: Weekly assignments will be posted on Canvas each Monday, and collected on the following Monday. Late homework can be accepted only within certain time, with a reduction in credit (see late submission policy below), unless it has been requested and approved in advance for extreme circumstances.

- Weekly quizzes: On each Friday, there will be a 10-minute quiz. The questions are more conceptual and the emphasis is more on ideas rather than final answers. Those quizzes are closed book and closed notes.

- Final Exam: Monday, February 14, 2022, 10:45 - 11:35 am, in our regular classroom. The final exam covers the materials discussed in the first five weeks of the semester.

- Exam Policies: All the midterm and final exams will be closed book and closed note exams. You are allowed to bring a 5 × 7 index card with your own handwritten notes. Laptops, tablets, and other wireless devices are not allowed in exams.
Table 1: Grading Scales

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<th>90-100</th>
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<th>80-84</th>
<th>75-79</th>
<th>70-74</th>
<th>65-69</th>
<th>60-64</th>
<th>55-59</th>
<th>45-54</th>
<th>0-44</th>
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<tr>
<td>Grade</td>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
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<td>C</td>
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**Late Assignments/Missed Assignments/Regrading Policies:** Assignments submitted late within one week after the due date can be accepted with a 50% reduction in credit. If you have an emergency situation that would result in late completion, you will need to e-mail the instructor before the original due date to explain and request an extension. Proper adjustment can be made only after the request is granted. Regrading is only performed if the mistake is caused by the teaching team.

**Incompletes:** According to university policy, to be considered for an incomplete, a student must have 20% or less of the course work remaining and be passing the course with a “C” or better. You must request an incomplete grade and I will consider giving that grade only under exceptional circumstances.

**COVID-19 CONSIDERATIONS:**

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 as described in the following:

**Vaccination**

- Get a COVID-19 vaccination and the booster shot recommended for pairing with your vaccine 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.

University of Utah students are required (as of August 27, 2021) to complete a cycle of COVID-19 vaccination and booster shot with an approved vaccine, or complete an exemption form. The university provides three convenient vaccination options:

- Attend one of the regularly scheduled vaccine events at the Student Union on campus.
- Schedule an appointment with Student Health [here](http://mychart.med.utah.edu/).
- Visit [https://alert.utah.edu/covid/vaccine/](https://alert.utah.edu/covid/vaccine/) or [http://vaccines.gov/](http://vaccines.gov/) to schedule your vaccination.
Masking

- 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.
  - With high transmission rates in Salt Lake County, the CDC recommends: “Everyone should wear a mask in public indoor settings.”
  - Treat masks like seasonal clothing (i.e. during community surges in COVID transmission, they should be worn indoors and in close groups outside).
  - In cases of classroom exposure, masks should be worn for the quarantine period.

Testing

- 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 [https://alert.utah.edu/covid/testing/](https://alert.utah.edu/covid/testing/)
  - Remember: Students, faculty and staff must self-report if they test positive for COVID-19 via this website: [https://coronavirus.utah.edu/](https://coronavirus.utah.edu/)

ACADEMIC CODE OF CONDUCT

Students are encouraged to review the Student Code for the University of Utah: [https://regulations.utah.edu/academics/6-400.php](https://regulations.utah.edu/academics/6-400.php)

In order to ensure that the highest standards of academic conduct are promoted and supported at the University, students must adhere to generally accepted standards of academic honesty, including but not limited to refraining from cheating, plagiarizing,
research misconduct, misrepresenting one’s work, and/or inappropriately collaborating. A student who engages in academic misconduct as defined in Part I.B. may be subject to academic sanctions including but not limited to a grade reduction, failing grade, probation, suspension or dismissal from the program or the University, or revocation of the student’s degree or certificate. Sanctions may also include community service, a written reprimand, and/or a written statement of misconduct that can be put into an appropriate record maintained for purposes of the profession or discipline for which the student is preparing.

ADDITIONAL POLICIES AND RESOURCES

Discrimination and Harassment: 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 Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS). Please see Student Bill of Rights, section E

http://regulations.utah.edu/academics/6-400.php

Undocumented Student Support: Immigration is a complex phenomenon with broad impact – those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit https://dream.utah.edu.

Veterans Center: If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5 pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/
Please also let me know if you need any additional support in this class for any reason.

Student Mental Health Resources:

- 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.

**Student Success Advocates:** The mission of Student Success Advocates is to support students in making the most of their University of Utah experience [http://ssa.utah.edu](http://ssa.utah.edu). They can assist with mentoring, resources, etc. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact a Student Success Advocate for support.

**The Americans with Disabilities Act:** 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 on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the University’s Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to 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 police, contact the Department of Public Safety, 801-585-2677(COPS).

**Campus Safety:** 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 [https://safeu.utah.edu](https://safeu.utah.edu)

**University Counseling Center:** The University Counseling Center (UCC) provides developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of University of Utah students. They advocate a philosophy of acceptance, compassion, and support for those they serve, as well as for each other. They aspire to respect cultural, individual and role differences as they continually work toward creating a safe and affirming climate.
for individuals of all ages, cultures, ethnicities, genders, gender identities, languages, mental and physical abilities, national origins, races, religions, sexual orientations, sizes and socioeconomic statuses.

**Office of the Dean of Students:** The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. Please consider reaching out to the Office of Dean of Students for any questions, issues and concerns. 200 South Central Campus Dr., Suite 270. Monday-Friday 8 am-5 pm.

**Tutoring Center:** Free tutoring is available in Room 155 of the T. Benny Rushing Mathematics Center, located between JWB and LCB. It opens M-Th 8:00 am - 8:00 pm, Fri 8:00 am - 6:00 pm. Please check


for more information about the tutoring service available.

**ADA Statement:** The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations for the course.

**Campus Safety:** 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).