

MATH 1320-004: Engineering Calculus II

Fall 2019

Lecture: MTWF 10:45-11:35am HEB 2006

Lab (005): Th 9:40-10:30am LCB 323

Lab (006): Th 10:45-11:35am AEB 310

Instructor: Peter McDonald

Pronouns: he/him/his

Email: mcdonald@math.utah.edu

Office: JWB 219

Office Hours: W 9:30-10:30am LCB 121, F 1-2pm LCB 323

TA (005): Thuong Nguyen, tnguyen@math.utah.edu

TA (006): Ruyi Ma, rma@math.utah.edu

TA Office Hours: 005: 12-1pm MTh **006:** 11-1pm T WEB 1705

Course Description: Differential and Integral Calculus II, with a focus on applications and projects for engineers: integral expressions for moments, centers of mass, and work; infinite series and sequences; power series and Taylor series; vectors, dot and cross products, and the geometry of space; the calculus of vector functions and particle motion in space; differential calculus for functions of several variables, including linear approximation, partial and directional derivatives, chain rule, and multi-variable optimization; multivariable integration in Cartesian and polar coordinates and applications.

Prerequisite(s): “C” or better in MATH 1310 OR AP Calc BC score of 3 or better OR Department Consent.

Credit Hours: 4

Text: *Calculus: Concepts and Contexts*, 4th Edition, James Stewart; **ISBN-13:** 978-0495557425

Course Outcomes:

The tools and skills

- Students will be able to utilize methods of integration to compute volumes of objects with circular-shaped aspects, and compute lengths of curves. These applications introduce a higher-level concept of integration, involving the summation of small volume segments dV or small length segments ds , which are computed by performing an appropriate parameterization to a real-number-line integral in terms of dx .
- Students will be skilled in using integration to compute problems important in physics and engineering. Students will know how to compute of an average value of a function using the mean value theorem for integrals, the center of mass for objects, and the computation of energy as a force integrated over a distance.
- Students will become skilled in computations and applications of infinite sequences and sums. Students will become familiar with the properties of infinite sums to either converge to a finite value or diverge to an infinite value, and will learn about methods to determine convergence. Students will be able to represent functions as a Taylor series, and use

Taylor's theorem to approximate functions and estimate error from using finitely many terms of the Taylor series.

- Students will learn important tools of calculus in higher dimensions. Students will become familiar with 2- and 3-dimensional coordinate systems, vectors and vector operations including the dot and cross product, and equations of lines, planes, and other surfaces. Students will also learn how to represent motion of objects in 3D using vector functions, how to represent velocity and acceleration using vector projections into tangential and centripetal coordinates of acceleration, and how to characterize curves in space by computing arc length and curvature. For functions of 3D surfaces, students will be able to characterize aspects of surfaces and volumes using partial derivatives and the gradient vector. Partial derivatives will also be used to describe approximating tangent planes to points on surfaces, and how to compute derivatives of multi-dimensional function compositions can be performed using a multi-dimensional version of the chain rule.
- Students will also learn the elementary procedures of multivariable integration on varied 2- and 3D domains using cartesian and polar coordinates. Students will learn applications of double and triple integrals including center-of-mass, moments, and probability.

Problem solving fluency

- Students will be able to read and understand problem descriptions, then be able to formulate equations modeling the problem usually by applying geometric or physical principles. Solving a problem often requires a series of transformations that include utilizing the methods of calculus. Students will be able to select the appropriate calculus operations to apply to a given problem, execute them accurately, and interpret the results using numerical and graphical computational aids.
- Students will gain experience with problem solving in groups. Students should be able to effectively transform problem objectives into appropriate problem solving methods through collaborative discussion. Students will also learn how to articulate questions effectively with both the instructor and TA, and be able to effectively articulate how problem solutions meet the problem objectives.

Grading Policy:

- **Homework (15%)**
 - There will be weekly homework, assigned from the textbook. The assignments will be posted on Canvas each Tuesday and will be due the following Tuesday at the beginning of class. Be sure to show all work.
 - Each homework will be graded for completion. In addition, the grader will randomly select 3 problems to grade.
 - Late homework will not be accepted. The lowest two homework scores will be dropped. Any regrade requests for an assignment must be received within a week of grades being posted.
- **Quizzes (10%)**

- **There will be a 10-15-minute, open-note quiz in class every Friday, except test weeks.** I reserve the right to start the quiz at any time during the Friday class period. Please note: the one exception to this schedule is that there will be a quiz on the last day of lecture, December 4.
 - The quiz will cover the material covered in the previous week. Quiz questions will be taken from textbook examples, class examples, assigned problems or problems very much like those problems.
 - If you miss points on a quiz, you will be able to come to office hours within a week of receiving your grade to discuss your mistakes and receive full credit for that quiz. If you do not take a quiz, you will receive a zero and will not be allowed to make up the lost points.
 - **There will be no make-up quizzes. Your lowest two quiz grades will be dropped.** This covers family, health, or other personal reasons that you may not be able to attend two Friday classes out of the semester. The only exceptions to the no make-up rule are for school-sanctioned absences. In this case, it is the student's responsibility to make arrangements with me ahead of time. Failure to do so may result in a zero for the corresponding quiz.
- **Weekly Lab (5+15=20%)**
 - Every Thursday students will meet for their laboratory section. These lab days will be spent working on more challenging homework problems. Students will work in groups, with facilitation by the TA. The goal of these problems is to give students a deeper understanding of how the mathematics is applied, with the goal of concept learning, and improving problem solving fluency—the skill of orchestrating many methods and skills, and interpretation of results, in order to achieve an stated objective.
 - **Attendance to the lab section is required**, and will count for 5% of a student's total grade.
 - The remaining 15% of the lab grade will be determined by the lab submissions that will be graded.
 - **The policies, grading criteria, and expectations of the lab will be communicated by the lab instructor during the first week.** Questions about the content or grading of the lab should be directed toward the lab instructor.
- **Two In-class Exams (15% each)**
 - There will be two midterm exams. The dates for these exams are fixed and are listed at the end of this syllabus. A practice exam and knowledge checklist will be posted roughly a week prior to the midterm that will cover the same material.
 - There will be no retakes of exams and I will not offer the exam at a later date. Any regrade request must be received within a week of grades being posted. Please plan accordingly.
- **Final Exam (25%)**
 - The final exam for this class is comprehensive and it will occur on **Monday, December 9th, from 10:30am to 12:30 pm.** I will not reschedule the final exam for students to have personal time or travel home, etc., so please plan your travel arrangements around this exam.

Letter Grade Distribution:

93-100	A	73 - 76	C
90 - 92	A-	70 - 72	C-
87- 89	B+	67 - 69	D+
83 - 86	B	63 - 66	D
80 - 82	B-	60 - 62	D-
77 - 79	C+	0-59	E

University Policies:

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 this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

University 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.

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, veterans 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).

Other Resources:

Math Tutoring Center

Do not hesitate to come to my office during office hours or by appointment to discuss a homework problem or any aspect of the course. Additionally, the T. Benny Rushing Mathematics Tutoring Center offers free tutoring. Beginning Thursday, May 18th, tutoring will be available from 8am to 8pm Monday through Thursday and 8am to 6pm on Friday. Their website can be found here: <https://www.math.utah.edu/ugrad/tutoring.html> If you want to hire an outsider tutor (for a fee), you can visit University Tutoring Services in 330 SSB. There is also a list of tutors available in the Math Department office in JWB 233

Veteran's Center

If you are a student veteran, the University of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-R 8am-5pm. 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.

LGBT Resource Center

If you are a member of the LGBTQIA* community, I want you to know that my classroom is a safe zone. Additionally, the University of Utah has an LGBT Resource Center on campus. They are located in Room 409 in the Olpin Union Building. Hours: M-F 8-5pm. You can visit their website to find more information about the support they can offer, a list of events through the center and links to additional resources: <http://lgbt.utah.edu/>. Please also let me know if there is any additional support you need in this class.

Important Dates

Drop Deadline	Friday, August 30
Labor Day (NO CLASS)	Monday, September 2
Midterm 1	Friday September 20
Fall Break (NO CLASS)	October 6-13
Withdraw Deadline	Friday, October 18
Midterm 2	Friday November 8
Thanksgiving Break (NO CLASS)	November 28-December 1
Final Exam	Monday, December 9, 10:30am

Calculator Policy: Calculators may be used on homework assignments and labs, but will not be allowed during quizzes or exams. Quiz and exam problems will be designed to not need the

Disclaimer: I reserve the right to change any information in this syllabus throughout the semester. If I make a change to the course policies, I will inform you in class, and post an updated version of the syllabus to Canvas. I will hold you accountable for information that is stated in class or posted on canvas.