

Mathematics 1320: Engineering Calculus II

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Class Hours: Monday, Tuesday, Wednesday and Friday, 10:45am - 11:35am

Class Room: LCB 225

Office Hours: TBA; also by appointment

Office: JWB 211

Text

Calculus: Concepts and Contexts, By James Stewart, 4th edition. ISBN: 13-9780495557425

An e-version of the textbook will automatically show up in Canvas provided that you opt in to the “inclusive access” program (which is the default case). The text is a \$40/semester rental that is added to the course fee. You may request to opt out at <https://portal.verba.io/utah/login>

Course Information

Math1320, Engineering Calculus. This is a 4-credit semester course.

Prerequisite

Math 1320 students are required to earn a ‘C’ or better in 1310 to enroll, or they can alternatively be entered by earning a ‘C’ or better in Math 1210 and by being concurrently enrolled in the Math 1320 “boot camp” that covers the material in 1310 that is missing from the traditional 1210 sequence. Practically speaking, you are better prepared for this course if you have a solid understanding of differentiation, integration, trigonometry, and if your grades in the prerequisite courses were above the ‘C’ level.

Course Description

The course is a continuation of the Math 1310 course and covers essential Calculus for Engineering applications. The course is structured into four lecture hours per week, and one lab hour per week (Thu). Topics covered include integral expressions for arc lengths, moment,s 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 and integral calculus for functions of several variables, including partial and directional derivatives, multi-variable optimization, and multiple integrals.

Expected Learning Outcomes

The goal of Math 1320 is to further master the basic tools for the study of functions, termed the calculus, and become skilled in its use for solving problems in science and engineering. Math 1310 is a prerequisite for Math 1320, and it is expected that Math 1310 content is sufficiently mastered to be able to move forward in 1320. These basic tools and problem solving skills are described below.

- Students will be able to utilize methods of integration to compute lengths of curves. These applications introduce a higher-level concept of integration, involving the summation of small length segments ds , which are computed by performing an appropriate parametrization to a real-number-line integral.
- 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 work 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 series and approximate functions using Taylor's theorem.
- Students will also 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 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.

Course Structure

- **In class:** In class the instructor will give lectures on the course material. Taking notes is recommended but not required, as on-screen notes will be posted on Canvas. The notes will be useful for completing weekly assignments and should be used as a guide for studying for quizzes and exams. You can expect to :
 - Work with your partner(s) on problems in class,
 - Have whole class discussions and lectures on pertinent material,
 - Be asked to brush up on review materials outside of class
 - Respond individually or as part of a group to questions.
- **In labs:** In addition to coming to class, you are expected to attend the lab you registered for. Labs are conducted by the teaching assistant(s) and during the lab sessions, you will work in small groups on problems that are given to you in the lab. You must submit your lab within the first 15 minutes of the following weeks lab session. No late labs will be accepted or makeup labs given. **The lowest two labs will be dropped.**
- **Homework:** To be assigned weekly. Each set is assigned on Friday and due **next Friday by 11:00PM**. If you click on a homework assignment in the Assignments tab in Canvas, you will see the list of assigned problems. **Homework assignments must be submitted to Canvas**. Homework that is late but not more than one week late may be accepted with half credit. Homework that is more than one week late will not be accepted. **The lowest three homeworks will be dropped.**
- **Quizzes:** To be assigned weekly, except for the midterm weeks. Each set is assigned on Friday and due **next Saturday by 11:00PM**. If you click on a quiz assignment in the Assignments tab in Canvas, you will see a link to the quiz sheet. **Quizzes must be submitted to Gradescope**, and the link for each quiz can be found in the Gradescope tab in Canvas. **The lowest three quizzes will be dropped but no make-up will be given.**
- **Midterms:** Two 50-minute midterm exams will be given on **Fridays, February 11 and March 18.**
- **Final exam:** **Tuesday, April 28, 10:30 am - 12:30 pm.** The final exam is comprehensive and students must take the final to pass the course.

Grading Policy

The grade will count the assessments using the following proportions:

- Homework: 10%
- Quizzes: 15%
- Lab sheets: 15%
- Midterms: 30%
- Final: 30%

Grading Scale

A (93-100), A- (90-92.9), B+ (87-89.9), B (83-86.9), B- (80-82.9), C+ (77-79.9), C (73-76.9), C- (70-72.9), D+ (67-69.9), D (63-66.9), D- (60-62.9), E (0-59.9).

Exam Policies

Exams (midterm and final) will be closed book and closed notes. **Calculators, laptops, and any other electronic devices will not be allowed.** For each exam, a practice problem set will be posted on Canvas one week before the actual exam to help you to prepare. In case there is a scheduling conflict with other academic or university sponsored events, an early schedule may be arranged if it is brought up to the instructor at least one week prior to the exam.

Tutoring Center and Computer Lab

T. Benny Rushing Mathematics Student Center (adjacent to JWB and LCB), Room 155

Monday - Thursday 8:00 am - 8:00 pm

Friday 8:00 am - 6:00 pm

Closed Saturdays, Sundays and holidays

<http://www.math.utah.edu/undergrad/mathcenter.php>

College of Engineering Tutoring Lab

Additional office hours held by the TAs for the engineering calculus sequence (MATH 1310, MATH 1311, MATH 1320, MATH 1321, MATH 3140) and MATH 2250 will be scheduled in WEB 1705. Hours are 9 am - 1 pm Monday through Thursday, every week. Detailed TAs hours will be posted once the schedule becomes available in the first week of the semester.

Private Tutoring

University Tutoring Services, 330 SSB. There is also a list of tutors at the Math Department office in JWB233.

Tentative schedule and weekly learning goals

The schedule is tentative and subject to change. However, dates of midterms and the final will not change.

Week 01, 01/10 - 01/14: 6.4-6.6

- Arc Length, Average values of a function, Applications-work/energy

Week 02, 01/17 - 01/21: 8.1-8.3

- Sequences, Series, Integral and comparison tests for series

Week 03, 01/24 - 01/28: 8.4-8.6

- Other convergence tests, Power series, Representing functions as power series

Week 04, 01/31 - 02/04: 8.7-8.8

- Taylor and Maclaurin Series, Applications of Taylor polynomials

Week 05, 02/07 - 02/11: Review & Midterm 1

- **Midterm 1 on Friday, February 11**
- More series review

Week 06, 02/14 - 02/18: 9.1-9.3

- Three dimensional coordinates, Vectors, Dot product

Week 07, 02/21 - 02/25: 9.4-9.5, 10.1

- Cross product, Equations of lines and planes, Vector functions and space curves

Week 08, 02/28 - 03/04: 10.2-10.3

- Derivatives and integrals of vector functions, Arc length and curvature

Week 09, 03/07 - 03/11: Spring Break

Week 10, 03/14 - 03/18: 10.4, 11.1-11.2 & Midterm 2

- **Midterm 2 on Friday, March 18**
- Velocity, acceleration in space, Functions of several variables, Limits of multivariate functions

Week 11, 03/21 - 03/25: 11.3-11.5

- Partial derivatives, Tangent planes, linear approximation, Chain rule

Week 12, 03/28 - 04/01: 11.6-11.7

- Directional derivatives and gradient vector, Maximum and minimum values

Week 13, 04/04 - 04/08: 11.8, 12.1

- Lagrange multipliers, Double integrals

Week 14, 04/11 - 04/15: 12.2-12.3

- Iterated integrals, Integration of general regions

Week 15, 04/18 - 04/22: 12.4-12.5

- Polar coordinates, Probability, center of mass.

Week 16, 04/25 - 04/29: Final review & Final exam

- **Final exam on Thursday, April 28**

Disclaimer

The syllabus is not a binding legal contract. It may be modified by the instructor and students will be given reasonable notice of the modifications.

Appendix

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. You 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, collusion, fraud, theft, etc. Students should read the Code carefully and know you are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, 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>

Academic dishonesty

Academic dishonesty is strictly not tolerated and subject to an automatic E in this course; your enrollment in this course indicates that you understand and will follow my and University policies regarding academic dishonesty. As defined in the University Code of Student Rights and Responsibilities, academic misconduct includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information. It also includes facilitating academic misconduct by intentionally helping or attempting to help another student to commit an act of academic misconduct.

Vaccination

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. Visit <http://mychart.med.utah.edu/>, <http://alert.utah.edu/covid/vaccine>, or <http://vaccines.gov/> to schedule your vaccination.

Masking

Salt Lake County has issued a mandatory mask order. This order applies to the University of Utah. All people are required to wear well fitting masks indoors or in "when queueing outdoors."

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. Saliva based testing is available at alert.utah.edu/covid/testing

Self-Reporting

All of us, including faculty, students, and staff, must self-report if we test positive for COVID-19 via this website: <https://coronavirus.utah.edu/>.

The following five items are standard syllabus items not directly related to Covid. Note, however, that some of the services described may be available only on a modified or limited basis due to the Covid pandemic. Check online or call the relevant unit for up to date information.

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, <https://disability.utah.edu/>. 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, office for equal opportunity and affirmative action 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, <https://oeo.utah.edu/contact-us/index.php> or to the Office of the Dean of Students, 270 Union Building, 801-581-7066, <https://deanofstudents.utah.edu/>. 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), <https://police.utah.edu/>.

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

University Counseling Center

The UCC staff is committed to supporting the mental health needs of our campus community. Their phone number is 801-581-6826. Their hours are Monday-Friday, 8:00am-5:00pm. For after-hours emergencies, contact the 24/7 Crisis Line: 801-587-3000. More information is at <https://counselingcenter.utah.edu/>.

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. To contact the Office of the Dean of Students, please email deanofstudents@utah.edu or call 801-581-7066. There is more information at <https://deanofstudents.utah.edu/> .