

Accelerated Engineering Calculus I - Math 1321
Spring 2019 - Sect 1 (2/4)

Lectures: MTWF 9:40am-10:30am - LCB 225
Labotary: H 8:35am-9:25am - LS 107 - Section 4
H 9:40am-10:30am - AEB 306 - Section 2
Instructor: Christel Hohenegger
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TA: Thuy Le, SB 321-B, thuy.t.le@utah.edu
Course webpage: CANVAS on CIS (<http://cis.utah.edu>)
Office Hours: TBD or by appointment

Textbook: *Calculus: Concepts and Contexts*, by James Stewart, 4th edition; BROOKS/COLE CENGAGE Learning, 2010; ISBN-13 0-495-55742-0; ISBN-10 0-495-55742-0; price about \$195.

Updates: Topics covered and assignments will be posted on CANVAS. Students are responsible for checking it periodically.

<http://utah.instructure.com/courses/542878>

Mathematics Tutoring Center: The Mathematics Tutoring Center, room 155 of the T. Benny Rushing Mathematics Center (adjacent to the LCB and JWB), offers free, drop-in tutoring to students enrolled in MATH 1321. The tutoring center will open Monday, August 27th, and the hours are: Monday - Thursday 8:00AM - 8:00PM and Friday 8:00am - 6:00pm. The tutoring center is closed during semester breaks, weekends, and University holidays. For more information consult the website.

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

The videos and problems from the website of the Khan Academy might be helpful.

<https://www.khanacademy.org/>

The math department has videos available online of the regular calculus classes from Intermediate Algebra to Calculus III.

<http://www.math.utah.edu/lectures/>

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 1622. Hours are 8am-5pm Monday-Thursday. TAs hours will be posted once the schedule is determined.

Prerequisites: C or better in MATH 1311 OR AP Calculus BC score of 4 or better, OR Departmental Consent.

Requirement Designation: Quantitative Reasoning (Math & Stat/Logic).

Course Attribute: Honors Course.

Credit Information: MATH 1321 is a 4-credit course.

Description: The course will cover essential of knowledge of Calculus, a set of tools to analyze the relationships and functions essential for modeling physical processes important in science and engineering applications. The course is structured into four lecture hours per week, and one lab hour per week. The lecture class will incorporate instructor lectures, weekly short quizzes, random pop quizzes, and group work. Lab sections will comprise group problem solving sessions led by the teaching assistant, homework discussion and students participation. Topics covered include sequences, series, vectors, surfaces, multi-variable calculus (differentiation and integration), polar, cylindrical and spherical coordinates, Green's Theorem, Stokes' Theorem and Divergence Theorem. The corresponding chapters are 8-13.

The work to be completed in Math 1321 comprises Canvas quizzes, weekly lab worksheets and quizzes, two super quizzes, two midterm exams, and a comprehensive final exam. Lab worksheets will be turned in on Mondays and quizzes will be given every Friday except during exam days and holidays. There will be one or two Canvas quizzes per week.

Learning Outcomes: The goal of Math 1321 is to master the basic tools for the study of functions of multiple variables and to become skilled in its use for solving problems in science and engineering. These basic tools and problem solving skills are described below.

Tools and skills:

- 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 Taylors theorem to approximate functions and estimate error from using finitely many terms of the Taylor series.
- 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 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 endpoints 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 Greens, 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.

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.

Reading: Students are expected to have read the corresponding sections prior to each class. We will cover about three sections per week. Even if students spend as little as ten minutes on this, it will make the discussion in class much clearer.

Attendance to the lab is mandatory and will be recorded. Students should attend all the lectures and attendance will be checked randomly. Quizzes, super quizzes and exams take place in lecture, and lab worksheets are due in class. Students should attend the lab session they are registered for.

Technologies: Students should refrain from using cell phones, tablets and laptops to check emails or social media accounts, to chat with friends, to play games, or to surf the web. Students are welcome to use technologies to take notes.

Lab: Every Thursday, a Teaching Assistant-directed lab section will be held. These lab sections, which have smaller class sizes, consist of working on lab worksheets. The worksheet tends to cover longer, more in-depth problems than those found in homework and exams, and will sometimes require use of software to complete. The TA will be there to help guide students through the problems and help with any computer challenges. Completion of worksheet-reports will require work outside of the lab hour. The group work will also help students prepare for the quizzes and exams. Credit will be given for both lab attendance and completed worksheets. Lab worksheets will be turned at the *beginning* of lecture on the following Monday. The lowest two worksheet scores will be dropped. No late worksheet (past the first fifteen minutes of lecture) will be accepted.

Quizzes: At the *beginning* of every Friday class (except when an exam or super quiz is scheduled), a short 1-2 problem quiz will be given, taking roughly 10 minutes. The quiz will cover relevant topics covered in the week's lectures. The two lowest score will be dropped. No make-up quiz will be given.

Super Quizzes: Two weeks prior to each exam, a more extensive quiz will be given at the *beginning* of class, consisting of 2-3 problems and taking roughly 30 minutes to complete. The super quiz will cover material from the preceding weeks. None of the super quizzes can be dropped. Students should check with the up-to-date CANVAS schedule for the dates of the super quizzes. The dates are **February 8 and March 29**.

Homework: Homework will not be collected or graded. Students are strongly encouraged to solve problems in the textbook to gain proficiency in the techniques and to

prepare for quizzes and exams. To assess students proficiency with the material, short CANVAS quizzes will be given regularly (about two per week). Students have 12 hours (from 12pm to 11:59pm) to complete the online quiz (5-10 minutes). No make-up will be given and no paper quiz will be accepted. The five lowest scores will be dropped.

Midterm exams: There will be two in-class exams. No books, notes, formula sheets, calculators (scientific or not), computers, phones (smart or not) or electronic devices (including smart watches) will be allowed. The tentative dates are: **February 22 and April 12**. Students should always consult CANVAS to confirm those dates and the material covered. None of the exams can be dropped. The lowest exam score can be replaced by the score of the final exam (if better).

Final Exam: The final exam covers all the material presented during the semester. It will be held on **Thursday, April 25, 2019 8:00am-10:00am** in the classroom.

Review and practice: A list of practice problems will be posted a week prior to the midterms and final exam. Review for the exams will occur both in class and in the lab.

Make-up and regrading: Any conflict leading to missed exams or super quizzes are the student's responsibility and must be arranged ahead of time or within a week past the test. Failure to do so may result in a zero for the corresponding test. Regrading inquiries must be submitted in writing within a week of the test being returned.

Students with Disabilities: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If students will need accommodations in the 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 the student and us to make arrangements for accommodations.

Grading: Grades are determined as a weighted average as follows

Attendance	Worksheets	Canvas Quizzes	Quizzes	Super Quizzes	Exams	Final
6%	10%	6%	10%	8%	35%	25%

Letter grades are determined according to the following grading scale.

A	$91\% \leq N \leq 100\%$	B-	$76\% \leq N < 79\%$	D+	$61\% \leq N < 64$
A-	$88\% \leq N < 91\%$	C+	$73\% \leq N < 76\%$	D	$55\% \leq N < 61\%$
B+	$85\% \leq N < 88\%$	C	$67\% \leq N < 73\%$	D-	$52\% \leq N < 55\%$
B	$79\% \leq N < 85\%$	C-	$64\% \leq N < 67\%$	E	$N < 52\%$

I reserve the right to modify these in special cases and to decide if a curve is needed.

Honor Code: 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>

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 anyone has been harassed or assaulted, students are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 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).

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 or 801-581-7776.

Classroom Social Equity: We will be using the name and pronoun that feels best for each student. Please advise us of any name or pronoun changes (and update CIS) so we can help create a positive and respectful learning environment. We strive to be ethical, kind, fair, inclusive and respectful in the classroom and expect students to behave likewise. In this regard, we request that:

- If a student has any sort of anxiety disorder, TBI, PTSD, C-PTSD, or any other challenge that might cause being called out in class or working in groups psychological harm, then please do tell us, discreetly. We will confidentially accommodate any such request.
- If a student's preferred name is different than the student's legal first name, please log into Canvas and go to Account (on far left)- Settings and change your Display Name to be the name you prefer to be addressed by.
- If there is ever a time that a student feels this course or the curriculum is not equitable, please email me or meet with me to discuss such concerns.

I reserve the right to change the policies stated in this syllabus at some point in the semester. If I do make a change to a policy, I will announce it in class and send the change in email or post an Announcement on Canvas.

Important Dates:

Class begins	January 7
Martin Luther King Jr. holiday	January 21
Super quiz 1	February 8
Presidents' Day holiday	February 18
Exam 1	February 22
Spring break	March 10-17
Super quiz 2	March 29
Exam 2	April 12
Class ends	April 23
Reading day	April 24
Final exam	April 25, 8:00am-10:00am
Grades available	May 13

Tentative Schedule:

Week 1	8.1- 8.3	Sum, Sequences, Series
Week 2	8.4-8.7	Power Series, Taylor and Maclaurin Series
Week 3	8.8, 9.1-9.3	Applications, Vectors, Dot Product
Week 4	9.4-9.7	Cross Product, Lines, Planes, Surfaces
Week 5	10.1-10.4	Vector Functions, Derivatives and Integrals
Week 6	10.5, 11.1-11.3	Functions of Several Variables
Week 7	Review	Exam 1
Week 8	11.4-11.7	Approximation, Gradient Vector, Max and Min Values
Week 9	11.8, 12.1-12.3	Lagrange Multipliers, Iterated Integrals
Week 10	12.4-12.7	Polar Coordinates, Applications, Triple Integrals
Week 11	12.7-12.9	Change of Variables, Jacobians
Week 12	13.1-13.3	Vector Fields, Line Integrals, FTC
Week 13	13.4-13.5	Green's Theorem, Curl and Divergence, Exam 2
Week 14	13.6-13.8	Surface Integrals, Stokes', Divergence Theorem
Week 15	Review	Final Exam

We want every student to be successful, not only in this class, but in their entire undergraduate career and we are here to help. Students should not be shy to ask questions during and after lectures, to come by office hours or to email us with any concerns, and to be engaged.

Have a great semester !