

Math 1321-001 (Spring 2018)

Accelerated Engineering Calculus II

Lectures: MTWF 9:40-10:30 am, LCB 225

Section 002 Lab: H 9:40-10:30 am AEB 306

Section 003 Lab: H 10:45-11:35 am AEB 306

Course Information

- **Instructor:** Samantha Hill
- **Office:** LCB (LeRoy Cowles building) 311
- **Email Address:** hill@math.utah.edu
- **Office Hours:** TBD and by appointment
- **Class Website:** Canvas will be used regularly (posting homework, grades, etc.)
- **TA:** Cody Fitzgerald, LCB 315
- **Prerequisites:** C or better in MATH 1311 OR AP Calculus BC score of 4 or better.
- **Textbook:** We will cover the remaining chapters (8-13) from the book used in Math 1311:

Title : Calculus: Concepts and Contexts, 4th Edition
Author : James Stewart
ISBN : 9780495557425

- **Credit Information:** Math 1321 is a 4-credit course.
 - **Requirement Designation:** Quantitative Reasoning (Math & Stat/Logic).
 - **Course Attribute:** Honors Course.
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Technology: Calculators will not be allowed on quizzes or exams.

Grading Policy:

- Homework (10%):
 - There will be weekly homework, assigned from the textbook. The assignments will be posted on **Canvas** and will be **due on Wednesdays at the beginning of class**. Be sure to show all work. Optional problems will also be posted, and while they will not be graded, they are fair game for exams and quizzes.
 - **Late homework will not be accepted.** Solutions to homework will be posted online after it is due.
- Quizzes (15%):
 - **Each Friday there will be a ~15-20 minute quiz** on that week's homework.
 - **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%):
 - **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 (2×15 = 30% total):
 - Students will have two in-class exams, fifty minutes in length, which will make up a total of 30% of your course grade.
 - The dates of the exams are Fridays **February 23 and April 13.**
 - **There will be no make-ups or retakes of exams.** Should it happen that you cannot make the test, please communicate with me IN ADVANCE and provide necessary justification of extenuating circumstances. In that case, I can find a fair solution to your problem.
- Final Exam (25%)
 - The final exam will be given on **Wednesday, May 2, 8:00am - 10:00am** in LCB 225.
 - You will not be allowed to make-up the final exam with the exception of truly extreme circumstances.

• Grading Scale

A	$93\% \leq N \leq 100\%$	B-	$80\% \leq N < 83\%$	D+	$67\% \leq N < 70\%$
A-	$90\% \leq N < 93\%$	C+	$77\% \leq N < 80\%$	D	$63\% \leq N < 67\%$
B+	$87\% \leq N < 90\%$	C	$73\% \leq N < 77\%$	D-	$60\% \leq N < 63\%$
B	$83\% \leq N < 87\%$	C-	$70\% \leq N < 73\%$	E	$N < 60\%$

Important Dates:

Classes begin	Monday, January 8
Last day to add without a permission code	Friday, January 12
Last day to add, drop, elect CR/NC, or audit classes	Friday, January 19
Midterm 1	Friday, February 23
Last day to withdraw from classes	Friday, March 2
Midterm 2	Friday, April 13
Last day to reverse CR/NC option	Friday, April 20
Classes end	Tuesday, April 24
Final Exam	Wednesday, May 2

Responsibilities: All students are expected to maintain adult and professional behavior in the classroom. Please respect your classmates by not engaging in idle chatter, using your cell phone, or otherwise creating distractions. More importantly, students are prohibited by the **Student Code** from cheating, as well as committing acts of fraud, vandalism, or theft.

Part of my responsibilities is maintaining a classroom conducive to learning and enforcing responsible classroom behavior. This instructor will take disciplinary actions, beginning with verbal warnings and ultimately progressing to dismissal from this class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

Math Tutoring Center: You may find that you need some extra help beyond what the class can provide. There are several tutoring services available. The Math Department has a free drop-in tutoring center located in the T. Benny Rushing Mathematics Center. Information about the center can be found at <http://www.math.utah.edu/undergrad/mathcenter.php>. For more personalized attention, the ASUU Tutoring Center (www.sa.utah.edu/tutoring) provides both individual and group tutoring at reasonable rates.

Extra Help: Other resources to check out may include the College of Engineering Tutoring Lab, Khan Academy videos online, or Calculus I, II, and III videos from the math department website: <http://www.math.utah.edu/lectures/>

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, 801-581-5020. The 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.

Course Description:

Completion of Math 1321 is equivalent to completing the entire three semester Calculus I, II, III sequence. We will cover Chapters 8 through 13 from the textbook used in Math 1311. We will cover vectors in the plane and in 3-space; differential calculus in several variables; integration and its applications in several variables; vector fields; line, surface and volume integrals; and Green's and Stokes' Theorems.

Learning Outcomes:

The goal of Math 1321 is to master the basic tools for the study of functions $f(x) = y$ and 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 Taylor's 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 Green's, 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.

Tentative Schedule

Week 1: §8.1-8.3 — Sequences, Series, Convergence Tests for Series, Estimating Sums

Week 2: §8.4-8.7 — Power Series, Representing Functions with Power Series, Taylor and Maclaurin Series

Week 3: §8.8, §9.1-9.3 — Applications of Taylor Polynomials, Three Dimensional Coordinates, Vectors, Dot Product

Week 4: §9.4-9.7 — Cross Product, Equations of Lines and Planes, Functions and Surfaces, Cylindrical and Spherical Coordinates

Week 5: §10.1-10.4 — Vector Functions, Space Curves, Derivatives and Integrals of Vector Functions, Arc Length, Curvature, Velocity, Acceleration

Week 6: §10.5, §11.1-11.3 — Parametric Surfaces, Functions of Several Variables, Limits, Partial Derivatives, Tangent Planes

Week 7: midterm exam 1 on material from weeks 1-6

Week 8: §11.4-11.7, Linear Approximation, Chain Rule, Directional Derivative, Gradient Vector, Maximum and Minimum Values

Week 9: §11.8, §12.1-12.3 — Lagrange Multipliers, Double integrals, Iterated Integrals, Integration over general regions

Week 10: §12.4-12.7 — Integrals in Polar Coordinates, Applications, Surface Area, Triple Integrals

Spring Break: no school

Week 11: §12.7-12.9 — Cylindrical/Spherical Coordinate Integrals, Change of Variables, Jacobians

Week 12: §13.1-13.3 — Vector Fields, Line Integrals, Fundamental Theorem of Line Integrals

Week 13: §13.4-13.6 — Green's Theorem, Curl and Divergence, Surface Integrals. **midterm exam 2 on material from weeks 7-12**

Week 14: §13.7-13.9 — Stokes' Theorem, Divergence Theorem, Summary

Week 15: Review

Week 16: finals week. **final exam on material from weeks 1-15**

Disclaimer: This syllabus has been created as a preview to the course and I have tried to make it as accurate as possible. However, I reserve the right to make reasonable changes to the above policies.