Mathematics 1310: Engineering Calculus I

Xuesong Bai (a.k.a. Maverick)

Fall 2019

E-mail: bai@math.utah.edu topgunbai683@gmail.com

Class Hours: Monday, Tuesday, Wednesday and Friday, 07:30am - 08:20am

Office Hours: TBA; also by appointment

Office: JWB 211 Class Room: LCB 215

Text

Calculus: Concepts and Contexts, By James Stewart, 4th edition. ISBN: 13-9780495557425
http://www.math.utah.edu/schedule/bookInfo/

Course Information

Math1310, Engineering Calculus. This is a 4-credit semester course.

Prerequisite

C" or better in ((MATH 1050 AND MATH 1060) OR MATH 1080 OR (MATH 1060 AND (Accuplacer AAF 263+ OR Accuplacer CLM 80+)))
OR AP Calc AB 3+
OR Accuplacer AAF 276+
OR Accuplacer CLM 90+
OR ACT Math 28+
OR SAT Math 650+
OR Department Consent.

Course Description

This course covers the essential materials in calculus with a special emphasis on engineering applications. It is organized in a weekly schedule that combines four lectures with one lab session.

Topics for this semester include: functions and their graphs, exponential and logarithmic functions, inverse functions, velocity and acceleration, the concepts of limit and derivative, geometric applications of the derivative, rate of change, chain rule and product/quotient rules, differentiation of polynomial, rational, trigonometric, exponential, and logarithmic functions, l'Hôpital's Rule, minimum and maximum value problems, indefinite and definite integrals, the fundamental theorem of calculus, substitution rule, integration by parts, improper integrals, areas between curves and volumes.

Expected Learning Outcomes

Upon successful completion of this course, a student should be able to:

1. Understand the making of functions from elementary functions via translation, scaling, and function composition; learn how to graph the corresponding function and identify its inverse function.
2. Master the concept of limiting value of a function as the argument approaches certain value. Take limits of algebraic and trigonometric expressions of the form $0/0$ (that simplify), nonzero number over 0, including limits that go to (positive or negative) infinity, limits that do not exist and limits that are finite.
3. Understand the concept of derivative as the limit of the ratio of the function value difference to the argument difference as the latter approaches zero. Know what rules to use to differentiate products and quotients.
4. Use the limit definition of derivatives to obtain derivatives of polynomial, rational and some trigonometric functions; understand the concept of continuity.
5. Understand the concept of chain rule to differentiate functions composed of elementary functions and functions that are implicitly defined; perform implicit differentiation and compute higher order derivatives.
6. Use differentiation to find stationary, singular and inflection points, as well as domain and limit information to determine vertical and horizontal asymptotes, and then use all of that information to sketch the graph of a curve for $y = f(x)$.
7. Model situations involving two related quantities and know how to use one rate of change to infer the other that may be difficult to observe. Use the concept of differentials to obtain function approximations, and solve optimization problems that involve maximum and/or minimum values resulting from engineering applications.
8. Understand the concept of indefinite integral as the antiderivative and the definite integral as the limiting value of a large sum.
9. Compute indefinite and definite integrals, using the power rule and basic substitution and the Fundamental Theorems of Calculus.
10. Apply the definite integral to compute areas between two curves, volumes of solids of revolutions, arc length, surface area for surfaces of revolution and center of mass.

Course Structure

- **In class:** In class I will give lectures on the course material. Taking notes is highly recommended. Your 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 everyday, 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 one week later before 5 PM collected in a box outside the instructor's office. Homework that is late but not more than one week late may be accepted with half credit. Hmework that is more than one week late will not be accepted. **The lowest three homeworks will be dropped.**
- **Quizzes:** A 10-minute quiz will be given on each Friday at the beginning of the class, except for the midterm days. **The lowest two quizzes will be dropped but no make-up will be given.**
- **Midterms:** Three 50-minute midterm exams will be given on **Fridays September 13, October 18, and November 15.** A practice exam and knowledge checklist will be posted roughly a week prior to the midterm that will cover the same material. **The lowest exam score will be dropped but no make-up will be given.**
- **Final exam:** **Tuesday, December 10, 8:00 am - 10:00 am.** 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, 08/19 - 08/23: 1.3-1.6

- Functions, Compositions, Exp and Log, Inverse Functions

Week 02, 08/26 - 08/30: 1.7-2.2

- Parametric Curves, Velocity, Limits

Week 03, 09/02 - 09/06: 2.3-2.5

- Limit Laws, Continuity, Limits Involving Infinity

Week 04, 09/09 - 09/13: 2.6-2.8 & Midterm 1

- **Midterm 1 on Friday, September 13**
- Derivatives and Rates of Change, Relationship between a Function and its Derivative

Week 05, 09/16 - 09/20: 3.1-3.3

- Derivatives of Polynomials and Exponentials, Product and Quotient Rules, Derivatives of Trig Functions

Week 06, 09/23 - 09/27: 3.4-3.5

- Chain Rule, Implicit Differentiation

Week 07, 09/30 - 10/04: 3.6-3.9

- Inverse Trig and Log Functions, and Their Derivatives, Linear Approx and Differentials

Week 08, 10/07 - 10/11: Fall break

Week 09, 10/14 - 10/18: 4.1-4.3 & Midterm 2

- **Midterm 2 on Friday, October 18**
- Related Rates, Max and Min Values, Derivatives and Shapes of Curves

Week 10, 10/21 - 10/25: 4.4-4.6

- Graphing, l'Hôpital's Rule, Optimization

Week 11, 10/28 - 11/01: 4.7-4.8, 5.1

- Newton's Method, Antiderivatives, Areas and Distances

Week 12, 11/04 - 11/08: 5.2-5.3

- Definite Integrals

Week 13, 11/11 - 11/15: 5.4-5.6 & Midterm 3

- **Midterm 3 on Friday, November 15**
- Fundamental Theorem of Calculus, Substitution Rule, Integration by Parts

Week 14, 11/18 - 11/22: 5.7, 5.9

- Other Integration Techniques, Approximate Integration

Week 15, 11/25 - 11/29: 5.10, 6.1

- Improper Integrals, Areas between Curves

Week 16, 12/02 - 12/06: 6.2-6.3 & Final review

- Volumes, Shells

Week 17, 12/09 - 12/13: Final Exam

- **Final exam on Tuesday, December 10**

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.

ADA Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access (CDA) (162 Olpin Union Building, 581-5020 (V/TDD)). CDA will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to CDA.

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