



**University of International Business and Economics  
International Summer School**

**MAT 110 Calculus I**

**Term: June 13<sup>th</sup> – July 14<sup>th</sup>, 2022**

**Instructor: Peng Gao**

**Home Institution: Beihang University**

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**Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)**

**Office hours: TBD**

**Discussion sessions: 2 hours each week**

**Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)**

**Credit: 4 units**

**Course Description:**

The course covers the following concepts: Functions of a real variable; Basics functions such as polynomial, exponential, logarithmic, and trigonometric functions; Limits and continuity; The derivative of a function of a real variable; The derivative as a function; Continuous and differentiable functions; Rules of differentiation; Implicit functions and their derivatives; Extreme values of a functions; The mean value theorem; First and Second derivative tests; Analyzing the shape of a graph of a function using derivatives; l'Hospital's rule for computing limits; Tangent line to the graph of a function; Taylor polynomials of a function; Analyzing the behavior of a function near a point using Taylor polynomials; Antiderivatives; Definite integral of a function; Geometrical significance of the definite integral of a continuous function over an interval; Indefinite integrals; The fundamental theorem of Calculus; Basic methods to compute integrals; The substitution rule.

**Course Goals:**

A student who satisfactorily completes this course should be able to:

1. Differentiate and integrate basic functions;
2. Analyze the shape of the graph of a function using derivatives of the function;
3. Investigate the extreme value problem for a function of a real variable;
4. Approximate a function by its Taylor polynomials near a point

**Required Text:**

Stewart, James. *Single Variable Calculus*: 8th edition with ISBN 978-1-285-74062-1

**Prerequisites:**

Students are expected to be familiar with basic algebra and trigonometry studied in high school.

**Attendance:**

Students are expected to be present at all class meetings and examinations.

**Grading Policy:**

There will be one midterm and a final exam in this class. All exams will be closed-book. No notes, calculators, or other electronic devices will be allowed.

The course grades will be calculated based on the following percentages:

- Homework: 30%
- Midterm: 30%
- Final Exam: 40%

The final exam will be cumulative. There will be no make-up exams.

**Grading Scale:**

Assignments and examinations will be graded according to the following grade scale:

<b>A</b>	90-100	<b>C+</b>	72-74
<b>A-</b>	85-89	<b>C</b>	68-71
<b>B+</b>	82-84	<b>C-</b>	64-67
<b>B</b>	78-81	<b>D</b>	60-63
<b>B-</b>	75-77	<b>F</b>	below 60

It should be noted that in many US colleges **C-** is not a passing grade if the course is required for a major.

**Class Rules:**

All academic work should be done with the high level of honesty and integrity. Academic misconduct of any kind may result in a grade penalty or the assignment of a failing grade.

**Course Schedule:**

**Week 1  
Assignment**

1.1 Four Ways to Represent a Function

Hw: 3, 7, 11, 25, 27, 31, 33, 41, 45, 57

1.2 Mathematical Models: A Catalog of Essential Functions

Hw: 1, 3, 5, 9, 11, 13

1.3 New Functions from Old Functions

Hw: 1, 3, 5, 7, 9, 11, 13, 15, 17, 23, 31, 35, 39

1.4 The Tangent and Velocity Problems

Hw: 1, 5, 7



- 1.5 The Limit of a Function  
Hw: 3, 5, 7, 11, 15, 29, 31, 33, 35, 39
- 1.6 Calculating Limits Using the Limit Laws  
Hw: 3, 5, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29
- 1.8 Continuity  
Hw: 11, 13, 15, 17, 19, 25, 35, 37, 53, 55

## Week 2 Assignment

- 2.1 Derivatives and Rates of Change  
Hw: 5, 7, 11, 13, 23, 31, 33, 35
- 2.2 The Derivative as a Function  
Hw: 1, 3, 5, 7, 9, 11, 19, 21, 23, 25
- 2.3 Differentiation Formulas  
Hw: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 25, 29
- 2.4 Derivatives of Trigonometric Functions  
Hw: 1, 3, 5, 7, 9, 11, 13, 15, 21, 23
- 2.5 The Chain Rule  
Hw: 7, 9, 11, 13, 15, 17, 19, 21, 25, 27, 29, 31, 33, 41
- 2.6 Implicit Differentiation  
Hw: 5, 7, 9, 11, 13, 15, 17, 19, 35
- 2.7 Rates of Change in the Natural and Social Sciences  
Hw: 1, 3, 5, 7, 9
- 2.8 Related Rates  
Hw: 1, 3, 5, 7, 9, 15, 17

## Week 3 Assignment

- 2.9 Linear Approximations and Differentials  
Hw: 1, 3, 7, 9, 11
- 3.1 Maximum and Minimum Values  
Hw: 3, 5, 15, 17, 19, 21
- 3.2 The Mean Value Theorem  
Hw: 5, 7, 11, 21
- 3.3 How Derivatives Affect the Shape of a Graph  
Hw: 1, 5, 7, 9, 15, 17, 33, 39
- 3.4 Limits at Infinity; Horizontal Asymptotes  
Hw: 1, 3, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 35
- 3.5 Summary of Curve Sketching  
Hw: 1, 3, 5, 7, 9, 15, 17, 21, 23
- 3.7 Optimization Problems  
Hw: 3, 5, 7, 13, 15, 21



Midterm Tuesday, June 28.

**Week 4  
Assignment**

3.9 Antiderivatives

Hw: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 25, 27, 31, 33

4.1 Areas and Distances

Hw: 1, 3, 5, 7, 17

4.2 The Definite Integral

Hw: 1, 3, 5, 9, 17, 19

4.3 The Fundamental Theorem of Calculus

Hw: 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 39

4.4 Indefinite Integrals and the Net Change Theorem

Hw: 1, 3, 5, 7, 9, 11, 13, 15, 21, 25, 27, 39

4.5 The Substitution Rule

Hw: 1, 3, 5, 7, 9, 13, 17, 25, 37

6.1 Inverse Functions

Hw: 5, 7, 9, 11, 17, 23, 25, 39

6.2 Exponential Functions and Their Derivatives

Hw: 3, 5, 7, 9, 11, 13, 15, 17, 23, 29, 33, 41

**Week 5  
Assignment**

6.3 Logarithmic Functions

Hw: 3, 5, 7, 9, 11, 13, 15, 17, 27, 29, 31, 39, 47, 53, 59

6.4 Derivatives of Logarithmic Functions

Hw: 3, 5, 7, 9, 15, 17

6.5 Exponential Growth and Decay

Hw: 1, 3, 5, 7, 9, 11, 15, 17, 21, 43, 71, 75, 77

6.8 Indeterminate Forms and L'Hospital's Rule

Hw: 1, 3, 9, 11, 13, 15, 17, 19, 21, 25, 27, 47, 51, 55, 61

Final Exam, July 14.