



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

MAT 110 Calculus I

Term: October 10th–December 2nd, 2022

Instructor: Shen Fan

Home Institution: China University of Petroleum

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Class Hours: 240–360 minutes each week (2,400 minutes in total)

Office Hours: TBD

Discussion Session: 60–120 minutes each week

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

Location: WEB (Live Streams & Pre-recorded Videos)

Credit: 4 units

Course Description:

In this course we will describe some basic ideas and techniques that lie at the foundation of all pure and applied mathematics. Major topics include: Limits of functions (numerically, graphically, and algebraically); Continuity and differentiability of functions; Computing derivatives using the difference quotient, power rule, sum and difference rules, product and quotient rules, and the chain rule; Employing derivatives to draw detailed graphs of functions and solve applications from business, science, and engineering; Trigonometric, exponential, and logarithmic functions and their derivatives, graphs, and use in applications; Antidifferentiation, finding both definite and indefinite integrals; Applying integrals in real-world applications; and inverse functions, exponential, logarithmic, and inverse trigonometric functions and their derivatives.

Course Goals:

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

1. Evaluate limits of functions, and describe the continuity/discontinuity of a function.
2. Calculate derivatives of functions using rules and using the definition of the derivative.
3. Use linearization to make approximations of functions.
4. Relate features of a function (increasing/decreasing, extrema, concavity, inflection points) to its derivatives.
5. Solve application problems using differential calculus.
6. Estimate definite integrals using Riemann sums, calculate definite integrals, both using evaluating the limit of Riemann sums and using the fundamental theorem of calculus.
7. Anti-differentiate functions, using the method of substitution when appropriate.
8. Solve application problems using integrals.

9. Calculate derivatives of inverse functions.

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:

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

Dates	Topics	Homework
Oct.10 (Pre-recorded Video)	1.1 Four Ways to Represent a Function	2, 7, 27, 31, 33, 41
	1.2 Mathematical Models: A Catalog of Essential Functions	2, 5, 11, 13

Oct.11 (Pre-recorded Video)	1.3 New Functions from Old Functions	6, 13, 15, 23, 31, 35
	1.4 The Tangent and Velocity Problems	1, 5
Oct.12 (Pre-recorded Video)	1.5 The Limit of a Function	5, 11, 15, 30, 33, 38
	1.6 Calculating Limits Using the Limit Laws	5, 6, 11, 15, 17, 22
Oct.17 (Pre-recorded Video)	1.8 Continuity	12, 19, 35, 37, 52
	2.1 Derivatives and Rates of Change	6, 13, 21, 33, 35
Oct.18 (Pre-recorded Video)	2.2 The Derivative as a Function	3, 21, 23, 25, 60
	2.3 Differentiation Formulas	2, 7, 9, 13, 15, 17, 21, 25, 30
Oct.24 (Pre-recorded Video)	2.4 Derivatives of Trigonometric Functions	2, 5, 9, 13, 15, 23
	2.5 The Chain Rule	7, 11, 15, 19, 25, 29, 53
Oct.25 (Pre-recorded Video)	2.6 Implicit Differentiation	7, 11, 15, 19, 35
	2.7 Rates of Change in the Natural and Social Sciences	5, 9
Oct.26 (Pre-recorded Video)	2.8 Related Rates	1, 5, 9, 15
	2.9 Linear Approximations and Differentials	3, 7, 9, 11
Oct.31 (Live Stream via Tencent Meeting)	3.1 Maximum and Minimum Values	15, 19, 21, 45
	3.2 The Mean Value Theorem	5, 7, 11, 21
Nov.1 (Live Stream via Tencent Meeting)	3.3 How Derivatives Affect the Shape of a Graph	5, 7, 9, 15, 33
	3.4 Limits at Infinity; Horizontal Asymptotes	7, 11, 15, 19, 23, 27, 31, 35
Nov.7 (Live Stream via Tencent Meeting)	3.5 Summary of Curve Sketching	3, 7, 11, 15, 49
	3.7 Optimization Problems	3, 7, 13, 15, 21
Nov.8 (Live Stream via Tencent Meeting)	Midterm	
Nov.9 (Live Stream via	3.9 Antiderivatives	5, 11, 17, 21, 25, 31

Tencent Meeting)	4.1 Areas and Distances	3, 5, 7, 17, 25
Nov.14 (Live Stream via Tencent Meeting)	4.2 The Definite Integral	3, 7, 9, 17, 19
	4.3 The Fundamental Theorem of Calculus	5, 7, 11, 15, 17, 19, 23, 39
Nov.15 (Live Stream via Tencent Meeting)	4.4 Indefinite Integrals and the Net Change Theorem	5, 9, 13, 15, 25, 27, 39
	4.5 The Substitution Rule	5, 7, 13, 17, 25, 37
Nov.21 (Live Stream via Tencent Meeting)	5.1 Area Between Curves	1, 13, 19, 27
	5.2 Volumes	1, 5, 11
Nov.22 (Live Stream via Tencent Meeting)	6.1 Inverse Functions	5, 7, 9, 11, 17, 23, 41
	6.2 Exponential Functions and Their Derivatives	3, 7, 11, 17, 23, 29, 41
Nov.23 (Live Stream via Tencent Meeting)	6.3 Logarithmic Functions	7, 11, 15, 31, 39, 47, 53, 59
	6.4 Derivatives of Logarithmic Functions	3, 5, 7, 9, 15, 17
Nov.28 (Live Stream via Tencent Meeting)	6.5 Exponential Growth and Decay	1, 5, 9, 15, 21
	6.6 Inverse Trigonometric Functions	1, 5, 9, 23, 33, 61, 65
	6.8 Indeterminate Forms and L'Hospital's Rule	9, 13, 17, 21, 25, 47, 55, 61
Dec. 2 (Live Stream via Tencent Meeting)	Review & Final Exam	