



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

**MAT 230 Multivariable Calculus (Calculus III)**

**Term: December 19<sup>th</sup>, 2022 – January 13<sup>th</sup>, 2023**

**Instructor: Guofu Yu**

**Home Institution: Shanghai Jiao Tong University**

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

**Discussion sessions: 2 hours each week**

**Office hours: TBD**

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

**Location: WEB**

**Credit: 4 units**

**Course Description:**

This class mainly focuses on derivatives and integrals of multivariable functions. In the differential parts, Calculus III contains limits, continuity and partial derivatives of multivariable functions. We apply Taylor expansion formula to discuss maximum and minimum values of functions. Lagrange multipliers method is introduced to find extreme values of constrained problems. Multiple integrals part contains double integrals and triple integrals, line integrals and surface integrals. Some important theorems are introduced in vector fields, including Green formula, Gauss formula and Stokes formula.

**Course Contents:**

On completion of this subject students should

1. Compute the scalar product and cross product of real vectors;
2. Have a good knowledge of equations of lines and planes in three-dimensional space;
3. Ability to compute the derivatives of both real scalar functions and real vector valued functions.
4. Apply Taylor theorem and Lagrange multiplier method to find the local and absolute maximum and minimum of functions.
5. Evaluate double integrals and triple integrals;
6. Apply Green's theorem, Gauss theorem and Stokes theorem and divergence theorem to evaluate line integrals, double integrals, triple integrals and surface integrals.

**Required Textbook:**

Calculus, by James Stewart, Eighth Edition. ISBN 978-0-538-49790-9

**Prerequisites:**

Students are expected to pass Calculus I, II

**Grading Policy:**

Grades for this course will be based on the following:

Assignments	20%
Midterm Test	40%
Final Examination	40%

**Lecture:** Each lecture will be uploaded on UIBE online learning platform on a daily basis. Students are required to watch them according to the course schedule.

**Discussion:** There will be two hours open session on ZOOM every week. The attendance of the discussion is important as it is part of your final score.

**Office hours:** TBD

**Exam:** Exam is taken online. We shall send the examination paper just a few minutes before the starting of the examination. Students are required to open their camera videos during the examination. Students must take pictures of their answer sheets and then send them to the given e-mail address.

**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

**Academic Integrity:**

Students are responsible for knowing policy regarding academic honesty. The University of International Business and Economics expects students to be honest in their academic work. Academic dishonesty is viewed as a serious violation of university rules and such misconduct is not accepted by academic community. In particular, students must refrain from plagiarism, cheating and collusion in connection with examinations, submitting substantially the same piece of work to different classes and must fully acknowledge all the sources of ideas and all assistance received in work submitted to the instructor for evaluation. Violation of the rules of academic honesty may lead to suspension or disqualification of the student from further study at the University.

### Attendance Policy:

Attendance in class is mandatory. If an absence is unavoidable, arrangements must be made in advance to avoid penalty. UIBE policy requires a medical certificate to be excused. Any unexcused absences may impact the student's grade. Moreover, UIBE policy is that a student who has missed more than one-third of the class (6 class times) of a course will fail.

### Course Schedule:

Date	Lecture	Readings
Day 1	The three-dimensional coordinate system. Vectors. The dot product of two real vectors.	Chapter 12.1 – 12.3
Day 2	The cross product. Equations of lines and planes	Chapter 12.4 – 12.5
Day 3	Vector functions and space curves. Derivatives and integrals of vector functions	Chapter 13.1 – 13.2
Day 4	Arc length and curvature. Motion in space: velocity and acceleration	Chapter 13.3 – 13.4
Day 5	Functions of several variables. Limits and continuity.	Chapter 14.1 – 14.2
Day 6	Partial derivatives. Tangent planes and linear approximations	Chapter 14.3 – 14.4
Day 7	The chain rule. Directional derivatives and the gradient vector	Chapter 14.5 – 14.6
Day 8	Maximum and minimum values. Lagrange multipliers	Chapter 14.7 – 14.8
Day 9	Review for the first midterm examination	Chapters 12, 13, 14
Day 10	Midterm Exam	Chapters 12, 13, 14
Day 11	Double integrals over rectangles. Double integrals over general domains	Chapter 15.1 – 15.3
Day 12	Double integrals in polar coordinates. Surface area	Chapter 15.4 – 15.6
Day 13	Triple integrals. Triple integrals in cylindrical coordinate. Triple integrals in spherical coordinates	Chapter 15.7 – 15.9
Day 14	Change of variables in multiple integrals Vector fields	Chapter 15.10 & Chapter 16.1
Day 15	Line integrals.	

Day 16	The fundamental theorem for line integrals	Chapter 16.2 – 16.3
Day 17	Green's theorem. Curl and divergence	Chapter 16.4 – 16.5
Day 18	Parametric surfaces and their areas. Surface integrals	Chapter 16.6 – 16.7
Day 19	Stokes theorem. The divergence theorem.	Chapter 16.8 – 16.9
Day 20	Review for the final examination	Chapters 12 - 16