University of International Business and Economics
International Summer School

MAT 230 Multivariable Calculus (Calculus III)

Term: October 26th – November 20th, 2020
Instructor: Shen Fan
Home Institution: China University of Petroleum
Class Hours: Monday through Friday, 120 minutes each day (2,400 minutes in total)
Office hours: to be announced
Discussion sessions: each Wednesday, time TBD
Email: TBD

Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)
Location：WEB
Credit: 4 units

Course Description：

The course covers the following concepts: vector algebra, lines, planes, curves, and surfaces in space, functions of several variables, multivariable limits and continuity, partial derivatives and differentiation of functions of several variables, extreme values of functions of several variables and the method of Lagrange multipliers, double and triple integrals, change of variables in multiple integrals, line and surface integrals, and applications of differentiation and multiple integration to vector fields (line and surface (flux) integrals of vector fields, fundamental theorem for line integrals, etc.).

Course Goals：

1. Have facility with the basic theory and techniques of integral and differential vector calculus: e.g., the various types of vector products, notions of arc length and curvature, generalizations of the derivative (partial derivatives, directional directives, etc.); integrals of multivariable functions, change of variables, vector fields, line integrals, divergence, gradient and curl, integrals of vector fields over surfaces, etc.
2. Have precise knowledge of the definitions, theorems, and derivations from the basic theory of multivariable calculus: e.g., the geometric interpretation of the dot product, various formulae for the arc length, the relationship between gradient and directional derivatives, the change of variable formula, and various generalizations of the fundamental theorem of calculus.
3. Have facility with basic calculational skills: e.g., facility with vectors, evaluation of arc length and curvature, ability to determine tangent planes, facility with the Lagrange multiplier method, ability to calculate double and triple integrals, surface integrals, etc.

4. Have a rudimentary ability to explain mathematical theory using rigorous mathematical reasoning.

Required Textbook:

Stewart, James. *Multivariable Calculus*, 7th edition

Attendance:

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

Prerequisites:

The course is based on Calculus II or its equivalent.

Grading Policy:

There will be daily quizzes, three midterms and one final exam in this class. All exams will be closed-book. No notes, calculators, or other electronic devices will be allowed, and having such a device in view during the exam is an academic honesty violation.

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, and having such a device in view during the exam is an academic honesty violation.

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:

A	90 and above	**C+**	65-69
A-	85-89	**C**	60-64
B+	80-84	**C-**	55-59
B	75-79	**D**	50-54
B-	70-74	**F**	below 50

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: (tentative)

Day	Topics
1	Three-dimensional Coordinates.
	Vectors.
2	Dot Product.
	Cross product.
3	Lines and Planes.
	Cylinders and Quadric Surfaces.
4	Vector Valued Functions and Space Curves; Derivatives and Integrals of Vector Functions.
	Derivatives and Integrals of Vector Functions; Arc Length.
5	Arc Length and Curvature.
6	Arc Length and Curvature.
	Functions of Several Variables.
7	Limits and Continuity.
	Partial Derivatives.
8	Partial Derivatives.
	Tangent Planes Differentiability and Chain Rule.
9	Chain Rule.
	Gradients, Directional Derivatives.
10	Max-Min Problems.
11	Lagrange Multipliers.
	Double integrals intro.
12	Iterated Integrals.
	Double Integrals
13	Double Integrals Continued.
	Double Integrals in Polar Coordinates.
14	Triple Integrals.
	Triple Integrals in Cylindrical Coordinates.

15	Triple Integrals in Spherical Coordinates.
16	Change of Variable Formula.
	Vector Fields.
17	Line Integrals.
	Fundamental Theorem of Calculus for Line Integrals.
18	Green's Theorem.
	Div, Grad, Curl.
19	Parametric Surfaces. Surface Integrals.
	Surface Integrals, continued.
20	Stokes's Theorem.