University of International Business and Economics

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International Summer School

MAT 225 Advanced Calculus

Term: May 27 – June 27, 2019
Instructor: Shen Fan
Home Institution: China University of Petroleum
Email: fans@cup.edu.cn
Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)
Office Hours: TBD
Discussion session: 2 hours each week

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

Course Description:

Derivative as a matrix. Chain rule. Implicit functions. Constrained maxima and minima. Jacobians. Multiple integration. Line and surface integrals. Theorems of Green, Stokes and Gauss. Fourier series and applications.

Course Goals:

The goal is, in addition to having students learn to solve advanced calculus problems, to improve critical thinking skills with regard to using the methods of calculus as an enhanced tool for problem solving.

Required Textbook:

Robert A. Adams and Christopher Essex, Calculus of Several Variables. 7th Edition ISBN: 9780321549297. Or any multivariable calculus text.

Grading Policy:

Grades will be determined as follows:
15% for the homework solutions
35% for the midterm exam
50% for the final exam

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

Class Rules:

Any academic misconduct of any type, especially cheating on an exam, will automatically trigger: (1) expulsion from the course; (2) the issuance of a failing grade for the course, (3) the issuance of a formal report about the student's misconduct to the student's home university, and (4) any other disciplinary or administrative action deemed appropriate by Professor Chen and the leaders of UIBE. Students are allowed to co-operate on, but not copy, homework exercises.

Attendance Policy:

The attendance of every student at all class sessions is mandatory. There will be limited exceptions based on formal written permission of the professor.

Course Schedule:

Day 1, Mon: A brief review of single variable calculus
Limits and continuity, derivatives, high-order derivatives, indefinite integrals, definite integrals

Day 2, Tues: Chapters 12 Partial Differentiation
Functions of several variables, limits and continuity, partial derivatives

Day 3, Wed: Chapters 12 Partial Differentiation
High-order derivatives, the chain rule, differentiability and differentials

Day 4, Thurs: Chapter 12 Partial Differentiation
Gradients and directional derivatives, implicit functions, Taylor series and approximations

Day 5, Mon: Chapter 13 Applications of Partial Derivatives
Extreme values, extreme values of functions defined on restricted domains, linear programming

Day 6, Tues: Chapter 13 Applications of Partial Derivatives
The method of Lagrange multipliers, problems with more than one constraint, nonlinear programming

Day 7, Wed: Chapter 13 Applications of Partial Derivatives

The method of least squares, linear regression, applications of the least square's method to integrals

Day 8, Thurs: Chapter 14 Multiple Integration
Iteration of double integrals in Cartesian coordinates, improper integrals and a mean-value theorem, double integrals in polar coordinates

Day 9, Mon: Chapter 14 Multiple Integration
Triple integrals, change of variables in triple integrals (Cylindrical coordinates, Spherical Coordinates)

Day 10, Tues: Chapter 14 Multiple Integration
Applications of multiple integrals (area, volume, etc.)

Day 11, Wed: Review session

Day 12, Thurs: Mid-term

Day 13, Mon: Chapter 15 Vector Fields
Vector and scalar fields, conservative fields, line integrals, line integrals of vector fields

Day 14, Tues: Chapter 15 Vector Fields
Surfaces and surface integrals, oriented surfaces and flux integrals

Day 15, Wed: Chapter 15 Vector Calculus
Gradient, divergence, and curl; some identities involving grad, div, and curl; Green's theorem; The divergence theorem

Day 16, Thurs: Chapter 15 Vector Calculus
Stokes's theorem, orthogonal curvilinear coordinates

Day 17, Mon: Chapter 16 Fourier series and applications
Periodic functions and Fourier series; convergence of Fourier series; derivatives, integrals and uniform convergence

Day 18, Tues: Chapter 16 Fourier series and applications
Fourier series on intervals, applications to differential equations, the infinite-dimension geometry of Fourier series, the isoperimetric inequality

Day 19, Wed: Review session

Day 20, Thurs: Final Exam