



Shanghai Jiao Tong University

MA082 Multi-variable Calculus (Calculus III)

<b>Instructor Information:</b>	Linghai Zhang Home Institution: Lehigh University Email: liz5@lehigh.edu Office Hours: Determined by Instructor		
<b>Term:</b>	May 25, 2020 – June 19, 2020	<b>Credits:</b>	4 units
<b>Class Hours:</b>	Monday through Friday, 120 minutes per teaching day		
<b>Discussion Sessions:</b>	2 hours each week, conducted by teaching assistant(s)		
<b>Total Contact Hours:</b>	66 contact hours (1 contact hour = 45 mins, 3000 mins in total)		
<b>Required Texts (with ISBN):</b>	Calculus, by James Stewart, Eighth Edition. ISBN 978-0-538-49790-9		
<b>Prerequisite:</b>	MA081 Calculus II		



### Course Overview

Calculus Three focuses on the partial derivatives and their applications of both real scalar functions and real vector valued functions, double integrals and triple integrals, line integrals and surface integrals, several theorems about important relationships between different forms of integrals.

### Course Goals

Students are expected to know very well how to compute the scalar product and cross product of real vectors, to find equations of lines and planes in three-dimensional space. Also, students will know very well how to compute the derivatives of both real scalar functions and real vector valued functions, how to use the derivative test and/or Lagrange multiplier method to find the local and absolute maximum and minimum of functions. Moreover, students are expected to know very well how to use various technical ideas to evaluate double integrals and triple integrals. Furthermore, students will know very well how to apply Green's theorem, Stokes theorem and divergence theorem to build relationships between line integrals, double integrals, triple integrals and surface integrals and then evaluate them.

### Grading Policy

Quizzes and Homework	30%
Midterm Examination	30%
Final Examination	40%

### Grading Scale

Number grade	Letter grade	GPA
90-100	A	4.0
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3.0
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2.0
62-64	C-	1.7
60-61	D	1.0
≤59	F (Failure)	0



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