



## Shanghai Jiao Tong University

### MA082 Multi-variable Calculus (Calculus III)

<b>Instructor Information</b>	Guofu Yu Home Institution: Shanghai Jiao Tong University Email: gfyu@sjtu.edu.cn Office Hours: Determined by Instructor		
<b>Term</b>	June 28 2021- July 29 2021	<b>Credits</b>	4 units
<b>Class Hours</b>	Monday through Thursday, 120 mins 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>	Students are expected to pass Calculus I, II		
The course might be moved to online delivery due to COVID-19 pandemic. Students will be notified once the decision is made.			



## Course Overview

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.

## Grading Policy

Assignments	20%
Midterm Test	40%
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



Due to the on-going pandemic, there is a possibility that in-person courses move to online delivery. Students will be notified once the decision is made.

If the in-person courses are to be changed to online courses, we will make a few adjustments:

**Lecture:** Each lecture will be uploaded on SJTU SCE 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:** Tuesday afternoon 14:00-15:00

**Exam:** If the course moves to the online-course, the 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.



## 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	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