SYLLABUS
OF UNDERGRADUATE COURSES
IN SHANTOU UNIVERSITY

COURSE TITLE:	CALCULUS A-II
COURSE CODE:	MAT1002A
CREDIT VALUE:	4
TEACHING HOURS:	64
PRE-REQUISIT:	NONE
DEPARTMENT:	MATHEMATICS
VERSION:	20150913- MAT1002A
COURSE COORDINATOR:	Xiantao Wang (SIGNATURE)
APPROVER:	(SIGNATURE)
APPROVED DATE:	

SCIENCE COLLEGE OF
SHANTOU UNIVERSITY

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1. Course Description

Calculus A-II is one of the professionally basic courses for all undergraduate students in department of Mathematics. The aim of this course is to help students to grasp the basic contents in Calculus, which include the basic principles of limit, continuity,differentiability and integrability of functions with several variables, and master the computation methods. The learning of this course will help the students to lay a solid foundation for the study of the successive courses and develop their ability to analyze and solve problems.

2. Intended Learning Outcomes

(The functions involved in the following are the ones with several variables)

Knowledge units	Teaching contents	Intended Learning Outcomes
1. Limit and continuity	1. The definition of functions; 2. The definition of limits of functions; 3. The properties of limits of functions; 4. The definition of continuity of functions; 5. The properties of continuous functions.	1. Understand the concepts of functions and limits. 2. Proficiently apply the basic operation rules and other properties of limits to find the values of the limits. 3. Understand the concept of continuity of functions and the properties of continuous functions.
2. Differentiability	1.The definition and computation of (higher order) partial derivatives; 2. Total differetials; 3. Derivation rules of composite and implicit functions; 4. Directional derivatives and gradient;	1. Understand (higher order) partial derivatives and total differentials; 2. Master the ways to find (higher order) partial derivatives and total differentials; 3. Master the ways to find the partial derivatives and differentials of composite functions by using the operation rules;

	5. The applications of differentiability in geometry; 6. Extrma.	4. Understand the concepts and properties of implicit functions and implicit systems; 5. Understand the concepts and properties of directional derivative and gradient; 6. Master the methods for derivation, directional derivative and gradient; 7. Understand the applications of differentiability in geometry; 8. Master the ways to find extrema.
3. Multiple integrals	1. The definition and properties of double integrals; 2. The ways to find double integrals; 3. Triple integrals; 4. The applications of triple integrals.	1. Understand the definition and properties of double integrals; 2. Master the ways to find double integrals. 3. Understand the definition and properties of triple integrals; 4. Master the ways to find triple integrals.
4. Curve and surface integrals	1. The curve integrals with respect to arc-length; 2. The curve integrals with respect to coordinates; 3. Green formula and its applications; 4. The area integrals with respect to surfaces; 5. The area integrals with respect to coordinates; 6. Gauss formula; 7. Stokes formula.	1. Understand the definition and properties of the curve integrals with respect to arc-length; 2. Master the computation of the curve integrals with respect to arc-length; 3. Understand the definition and properties of the curve integrals with respect to coordinates; 4. Master the computation of the curve integrals with respect to coordinates; 5. Understand the relationships between the two kinds of the curve integrals; 6. Master Green formula; 7. Understand the definition and properties of the area integrals with respect to surfaces; 8. Master the computation of the area integrals with respect to surfaces; 9. Understand the definition and properties of the area integrals with respect to coordinates; 10. Master the computation of the area

		integrals with respect to coordinates; 11. Understand the relationships between the two kinds of the area integrals; 12. Master Gauss formula and Stokes formula.

3. Pre-Requisit

Calculus A-I.

4. Textbooks and Other Learning Resources

Textbooks:

(1) Advanced mathematics (in Chinese), Volumes I and II, edited by Department of Mathematics, Tongji University, 7th edition, Higher Education Press, 2014.
(2) Mathematical analysis (in English), Volume I, Vladimir A. Zorich, Springer, 2004.

Reference textbook:

(1) Mathematical analysis (in Chinese), Volumes I and II, edited by Department of Mathematics, East China Normal University, 4th edition, Higher Education Press, 2015.

5. Teaching and Learning Activities

Theoretical lessons (hours)		Exercise lessons (hours)		Other lessons (hours)	
T-hours	E-hours	T-hours	E-hours	T-hours	E-hours
58	64	6	64	None	None

Note: “T-hours” stands for “teaching hours”, and “E-hours” means “extracurricular hours”.

6. Assessment Scheme

Examinations	Examination contents	Intended Learning Outcomes	Weight Value %
Homework	All knowledge units	1. The definition of functions; 2. The definition of limits of functions;	20

		3. The properties of limits of functions; 4. The definition of continuity of functions; 5. The properties of continuous functions; 6. The definition and computation of (higher order) partial derivatives; 7. Total differetials; 8. Derivation rules of composite and implicit functions; 9. Directional derivatives and gradient; 10. The applications of differentiability in geometry; 11. Extrma; 12. The definition and properties of double integrals; 13. The ways to find double integrals; 14. Triple integrals; 15. The applications of triple integrals; 16. The curve integrals with respect to arc-length; 17. The curve integrals with respect to coordinates; 18. Green formula and its applications; 19. The area integrals with respect to surfaces; 20. The area integrals with respect to coordinates; 21. Gauss formula; 22. Stokes formula.	
First quiz	Limits, continuity and differentiability	1. The definition of functions; 2. The definition of limits of functions; 3. The properties of limits of functions; 4. The definition of continuity of functions; 5. The properties of continuous functions. 6. The definition and computation of (higher order) partial derivatives; 7. Total differetials; 8. Derivation rules of composite and implicit functions; 9. Directional derivatives and gradient; 10. Extrema	10
Second quiz	Multiple integrals	1. The definition and properties of double integrals; 2. The ways to find double integrals;	10

		3. Triple integrals; 4. The applications of triple integrals.	
Terminal examination	All knowledge units	1. The definitions of functions; 2. The definitions of limits of functions; 3. The properties of limits of functions; 4. The definitions of continuity of functions; 5. The properties of continuous functions; 6. The definition and computation of (higher order) partial derivatives; 7. Total differetials; 8. Derivation rules of composite and implicit functions; 9. Directional derivatives and gradient; 10. The applications of differentiability in geometry; 11. Extrma; 12. The definition and properties of double integrals; 13. The ways to find double integrals; 14. Triple integrals; 15. The applications of triple integrals; 16. The curve integrals with respect to arc-length; 17. The curve integrals with respect to coordinates; 18. Green formula and its applications; 19. The area integrals with respect to surfaces; 20. The area integrals with respect to coordinates; 21. Gauss formula; 22. Stokes formula.	60

7. Teaching Schedule

Week ordinal	Teaching form	Teaching hours	Teaching contents
1	T-S	2	The basic concepts of functions with several variables

		2	The basic concepts of functions with several variables
2	T-S	2	The partial derivatives
		2	Total differentials
3	T-S	2	The derivation of composite functions
		2	The derivation of implicit functions
4	T-S	2	The applications of differentiability in geometry
		2	The directional derivative and gradient
5	T-S	2	Extrema
		2	Extrema
6	T-S	2	Exercises
		2	First quiz
7	T-S	2	The definition and properties of double integrals
		2	The computation of double integrals
8	T-S	2	The definition, properties and computation of multiple integrals

		2	The applications of multiple integrals
9	T-S	2	Exercises
		2	Second quiz
10	T-S	2	The definition and properties of curve integrals w.r.t. arc-length
		2	The computation of curve integrals w.r.t. arc-length
11	T-S	2	The definition and properties of curve integrals w.r.t. coordinates
		2	The computation of curve integrals w.r.t. coordinates
12	T-S	2	Green formula and its applications
		2	Green formula and its applications
13	T-S	2	The definition and properties of area integrals w.r.t. surfaces
		2	The computations of area integrals w.r.t. surfaces
14	T-S	2	The definition and properties of area integrals w.r.t. coordinates
		2	The computations of area integrals w.r.t. coordinates
15	T-S	2	Gauss formula
		2	Stokes formula
16	T-S	2	Exercises
		2	Overall review

Note: “T-S” stands for “teaching and seminar”.