

SYLLABUS OF UNDERGRADUATE COURSES IN SHANTOU UNIVERSITY

COURSE TITLE:	<u>MATHEMATICAL ANALYSIS-I</u>
COURSE CODE:	<u>MAT1002A</u>
CREDIT VALUE:	<u>5</u>
TEACHING HOURS:	<u>80</u>
PRE-REQUISIT:	<u>CALCULUS A-I, A-II</u>
DEPARTMENT:	<u>MATHEMATICS</u>
VERSION:	<u>20131213- MAT1002A</u>
COURSE COORDINATOR:	<u>Xiantao Wang (SIGNATURE)</u>
APPROVER:	<u>(SIGNATURE)</u>
APPROVED DATE:	<u></u>

**SCIENCE COLLEGE OF
SHANTOU UNIVERSITY**

MAY 2017

1. Course Description

Mathematical analysis-I 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 limit, the completeness theorems of real numbers and their applications, Taylor theorem and its applications, the existence theorem of implicit theorem etc. 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 one variable)

Knowledge units	Teaching contents	Intended Learning Outcomes
1. Basic theory of calculus with one variable (continued)	1. The conditions for the existence of limits; 2. The completeness theorems of real numbers; 3. The continuity of functions in a closed interval (continued); 4. The uniform continuity; 5. The differential mean value theorems; 6. The conditions for the existence of extrema.	1. Understand the conditions for the existence of limits. 2. Understand the theory of real numbers and related theorems; 3. Proficiently grasp the properties of continuous functions in closed intervals (continued); 4. Understand the uniform continuity; 5. Proficiently grasp the applications of the differential mean value theorems; 6. Proficiently grasp the applications of the conditions for the existence of limit.
2. Basic theory of calculus with	1. The conditions for functions to be differentiable; 2. Taylor's formula; 3. The conditions related	1. Grasp the conditions for functions to be differentiable; 2. Master the way to expand functions at a point; 3. Grasp the applications of the

several variables (continued)	to extrema.	existence conditions of extrema.
3. Implicit functions (continued)	1. The uniqueness of implicit functions; 2. The differentiability and extrema of implicit functions; 3. Applications of implicit functions; 4. The conditional extrema.	1. Understand the uniqueness of implicit functions; 2. Understand the differentiability and extrema of implicit functions; 3. Master the applications of implicit functions in geometry; 4. Master the methods to find conditional extrema.

3. Pre-Requisit

Calculus A-I and Calculus A-II.

4. Textbooks and Other Learning Resources

Textbooks:

- (1) Mathematical analysis (in Chinese), Volume I, edited by Department of Mathematics, East China Normal University, 4th edition, Higher Education Press, 2014.
- (2) Mathematical analysis (in English), Volume I, Vladimir A. Zorich, Springer, 2004.

Reference textbook:

- (1) Answers to Demidovich's exercises in mathematical analysis (《吉米多维奇数学分析习题解答》), Volumes I to VI, 4th edition, Shandong science and technology press, 2012.

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
64	64	16	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	<ol style="list-style-type: none"> 1. Understand the conditions for the existence of limits; 2. Understand the theory of real numbers and related theorems; 3. Proficiently grasp the properties of continuous functions in closed intervals (continued); 4. Understand the uniform continuity; 5. Proficiently grasp the applications of the differential mean value theorems; 6. Proficiently grasp the applications of the conditions for the existence of limit; 7. Grasp the conditions for functions to be differentiable; 8. Master the way to expand functions at a point; 9. Grasp the applications of the existence conditions of extrema; 10. Understand the uniqueness of implicit functions; 11. Understand the differentiability and extrema of implicit functions; 12. Master the applications of implicit functions in geometry; 13. Master the methods to find conditional extrema. 	20
Midterm examination	Basic theory of calculus with one variable	<ol style="list-style-type: none"> 1. Understand the conditions for the existence of limits. 2. Understand the theory of real numbers and related theorems; 3. Proficiently grasp the properties of continuous functions in closed intervals (continued); 4. Understand the uniform continuity; 5. Proficiently grasp the applications of the differential mean value theorems; 6. Proficiently grasp the applications of the conditions for the existence of limit. 	20
Terminal	All knowledge	<ol style="list-style-type: none"> 1. Understand the conditions for the existence 	60

examination	units	of limits; 2. Understand the theory of real numbers and related theorems; 3. Proficiently grasp the properties of continuous functions in closed intervals (continued); 4. Understand the uniform continuity; 5. Proficiently grasp the applications of the differential mean value theorems; 6. Proficiently grasp the applications of the conditions for the existence of limit; 7. Grasp the conditions for functions to be differentiable; 8. Master the way to expand functions at a point; 9. Grasp the applications of the existence conditions of extrema; 10. Understand the uniqueness of implicit functions; 11. Understand the differentiability and extrema of implicit functions; 12. Master the applications of implicit functions in geometry; 13. Master the methods to find conditional extrema.	
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7. Teaching Schedule

Week ordinal	Teaching form	Teaching hours	Teaching contents
1	T-S	2	Properties of the limit of sequences (continued)
		3	Exercises
2	T-S	2	Basic theorems on real numbers I

			Holiday for National Day.
3	T-S	2	Basic theorems on real numbers II
		3	Basic theorems on real numbers III
4	T-S	2	Basic theorems on real numbers IV
		3	Basic theorems on real numbers V
5	T-S	2	Basic theorems on real numbers VI
		2	The proofs of properties of continuous functions in closed intervals I
6	T-S	2	The proofs of properties of continuous functions in closed intervals II
		3	Differential mean value theorems and Taylor's formula
7	T-S	2	Other types of limits of functions
		3	Exercises
8	T-S	2	Differentials
		3	Taylor's Formula I
9	T-S	2	Midterm examination
		3	Taylor's Formula II

10	T-S	2	Exercises
		3	Exercises
11	T-S	2	Completeness theorems in the plane
		3	Limits and continuity of functions with two variables
12	T-S	2	Double limits and iterated limits
		3	Exercises
13	T-S	2	Taylor's formula
		3	Extrema and conditional extrema I
14	T-S	2	Extrema and conditional extrema II
		3	Extrema and conditional extrema III
15	T-S	2	The existence theorems of implicit functions I
		3	Exercises
16	T-S	2	The existence theorems of implicit functions II
		3	Exercises

Note: "T-S" stands for "teaching and seminar".