**Course Syllabus for Mathematical Analysis (I)**

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**I．Basic Information of the course**

**Course Name**: Mathematical Analysis (I)  
**Course Identification Number:**100616T003

**Faculty or Department:** Department of Mathematics; College of Science

**Credits: 6**

**Total hours:** 96

**Lab hours:** 0

**Computer Hours:** 0

**Course Category (compulsory/limited/selective, semester, type):** compulsory,

**Target major:** pure and applied mathematics undergraduates

**Prerequisites**: None

Subsequent course: Mathematical Analysis (II)，Mathematical Analysis (III)，Function of Real Variable, Complex Function with One Variable, Functional Analysis, Differential Equation, Probability Theory

**II．Introduction of the course**

Mathematical Analysis(I) is an main fundamental course of all mathematical courses, which contains aggregate and mapping (including function),limit theorem(Sequence Limit and function Limit, The Continuity Theory of Real Number and Properties of Continuous Function etc),differential calculus(the calculus monadic function, Application of Differential Theorem of Mean)，Integral Calculus (Indefinite Integral，Definite Integral and Abnormal Integral). Through the study of this course, it can provide necessary fundamental knowledge for the subsequent courses such as Mathematical Analysis（Ⅱ）,（Ⅲ）, Real Variable Function Theory, Complex Function Theory, Functional Analysis, Differential Equation, Probability Theory etc and the related elective courses. Simultaneously, it can provide necessary trainings for mathematical thinking and quality of students. So the students are expected to deepen understanding of the basic concepts and theories. Besides, through the training of plentiful exercises, the abilities of calculating skills, abstract thinking, logical argumentation, space imagination and applying knowledge to solve problems are expected to develop.

**III. Objects of the course:**

Students should master the basic definitions, theories of the course. students should acquire the basic calculation ability, the logical and spatial thinking abilities. Furthermore, the students should acquire the ability to solve mathematical problems using the acknowledges of the course.

The students should meet the following requirements:

1.Master the definition of limits, and find the limits of a function or series.

2. Master the definition of derivative.

3. Master the definitions of derivative, difference and can find the differentials of function..

4. Master the definitions of integral, and using integral for problem solving.

5. Be able to solve some simple practical problems by using what you have learned

**IV. Course contents and requirements**

The teaching includes 8 chapters of lectures to be finished in the fall semester. The contents, objectives and hour allocation are as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contents** | | | **Objectives** | | | | **H**  **o**  **u**  **r**  **s** |
| memorizing | understanding | application | comprehensive analysis |
| **Chapter 1**  **Set,Mapping and Function** | | **Unit 1**Set |  | A | B |  | 4 |
| **Unit 2**Mapping and Function |  | A | B |  | 4 |
| **Chapter 2 Limitof NumericalSequence** | | **Unit 1**Continuity of Real Number |  | A | B |  | 4 |
| **Unit 2**Limit of Numerical Sequence |  | A | A |  | 6 |
| **Unit 3**Infinite |  | A | B |  | 2 |
| **Unit 4**Convergence Criteria |  | A | A |  | 4 |
| **Chapter 3Functional Limit and Continuous Function** | **Unit 1**Limit of a Functions | |  | A | A |  | 4 |
| **Unit 2**Continuous Function | |  | A | A |  | 4 |
| **Unit 3**The Order of Infinitesimals and the Order of Infinity | |  | A | A |  | 4 |
| **Unit 4**Continuous Functions on Closed Interval | |  | A | A |  | 4 |
| **Chapter 4Differential** | **Unit 1**Differential and Differential Quotient | |  | A | A |  | 2 |
| **Unit 2**The Properties and Geometric Meaning of Differential Quotient | |  | A | A |  | 2 |
| **Unit 3**The Four Fundamental Operations of Differential Quotient and Rules for Differentiating Inverse Functions | |  | A | A |  | 2 |
| **Unit 4**Rule and Operation for Differentiating Compound Functions | |  | A | A |  | 4 |
| **Unit 5**Higher Derivative and Higher Differentiation | |  | A | A |  | 2 |
| **Chapter 5Differential Mean Value Theorem and its Applications** | **Unit 1**Differential Mean Value Theorem | |  | A | A |  | 4 |
| **Unit 2**Rule of L’Hospital | |  | A | A |  | 2 |
| **Unit 3**Formula of Taylor and Interpolation Polynomial | |  | A | A |  | 2 |
| **Unit 4**The Taylor Formula and Its Applications | |  | A | A |  | 2 |
| **Unit 5**Examples and Applications of Taylor Formula | |  | A | A |  | 2 |
| **Unit 6**Approximate Calculation of Equations | | A |  |  |  | 2 |
| **Chapter 6**  **Indefinite Integral** | **Unit 1**Definition and Algorithm of Indefinite Integral | |  | A | A |  | 2 |
| **Unit 2**Integration by Substitution and Integration by Parts | |  | A | A |  | 4 |
| **Unit 3**Indefinite Integral of Rational Functions and Its Applications | |  | A | A |  | 2 |
| **Chapter 7Definite Integral** | **Unit 1**Definition of Definite Integral and Its Integrality Condition | |  | A | A |  | 2 |
| **Unit 2**Basic Properties of Definite Integral | |  | A | A |  | 4 |
| **Unit 3**Fundamental Theorem of Calculus | |  | A | A |  | 4 |
| **Unit 4**Applications of Definite Integral in Geometry | |  | A | A |  | 2 |
| **Unit 5**Applications of Calculus | |  | A | A |  | 2 |
| **Unit 6**Numerical Evaluation of Definite Integral | | A |  |  |  | 2 |
| **Chapter 8Improper Integral** | **Unit 1**Definition and Evaluation of Improper Integral | |  | A | A |  | 2 |
| **Unit 2**Convergence Criteria of Improper Integral | |  | A | A |  | 4 |
| Total | | | | | | | 96 |

Notes:

In the column of “objectives”, A, B and C indicate the degree to which a student is supposed to grasp the contents of lectures, A for highest degree and Null for no requirements.

*Memorize* means one can retrieve relevant knowledge, concepts, terms or other information in his/her memory bank, compare them with the current information and then confirm; one can memorize, list or describe them indiscriminately.

*Understand* means one can organize, categorize, explain, summarize what he/she has learned and make inferences about them or expand on them.

*Apply* means one can choose appropriate procedures and applications to apply what he/she has learned to calculation and decision making.

*Comprehensive Analysis* means one can identify the components in what he/she has learned and construct their relationship; or one can plan, build, construct or change and reconstruct; or one can comment, summarize, estimate, predict, evaluate, confirm or defend.

**V. Teaching Method**

Interactive teaching in classroom and classroom exercises

**VI. Evaluation**

The total grade = assignment and in-class performance (assignments, tests, attendancy, classroom performance) **20%+**four test grades\*20%+ final exam \*60%

**VII. Textbooks and Reference Books**

(I)Textbook

***Mathematics Analysis***, Chen Jixiu, Yu Chonghua, Jin Lu, Higher Education Publisher, 2004.

(II)Reference books

1. ***Mathematical analysis***, the math department of Jilin, People Education Publisher,2008.
2. ***Mathematical analysis***, Guangzhong OuYang, Xueyan Zhu, Fulin Jin, Chuanzhang Chen, High Education Publisher, 2013.
3. ***Mathematics Analysis Exercise***, Б.Д，Jimiduoweiqi (USSR), Higher Education Publisher, 1978.
4. ***Mathematics Analysis Exercise***, Lin Yuanquect, Higher Education Publisher, 1986.
5. ***Mathematical analysis*** I, V. A. Zorich, Springer, 2006.
6. ***Mathematical analysis II***, V. A. Zorich, Springer, 2006.
7. ***Calculus***, J. Stewart, High Education Publication, 2014.