

# Teaching Content Reform of Engineering Mathematical Analysis Course for Artificial Intelligence Specialty

GONG Benxue

School of Mathematics and Statistics, Shandong University of Technology Zibo, China

**Abstract:** According to the requirements of the training objectives of artificial intelligence specialty and the curriculum characteristics of "engineering mathematical analysis" course, this paper further optimizes the teaching content and strengthens the teaching of basic content, so as to improve students' abstract thinking ability and essential understanding of calculus content, and lay a solid foundation for the study of follow-up courses.

**Keywords:** *Engineering Mathematical Analysis; Artificial Intelligence; Teaching Content Reform*

## I. INTRODUCTION

With the rapid development of science and technology, the requirements for the comprehensive quality and innovation ability of scientific researchers are higher and higher. Therefore, how to strengthen the cultivation of students' thinking ability and innovative consciousness has become one of the key problems of talent cultivation under the new educational format. In the undergraduate stage of professional basic education, mathematics teaching plays a very important role in the cultivation of students' comprehensive quality and innovative ability. This course not only has a long teaching time, but also plays an irreplaceable role in students' thinking training and the improvement of their ability to analyze and solve problems. According to the needs of artificial intelligence specialty for mathematics and mathematics teaching and the construction of new engineering specialty, the artificial intelligence specialty of our college uses the course of "engineering mathematical analysis" to replace the original course of "advanced mathematics". Compared with higher mathematics courses, engineering mathematics analysis adds contents such as upper and lower supremum, basic theorems of real numbers, upper and lower limits, parametric integration, etc. through the increase of these contents, students can have a more thorough understanding of the completeness of this course and a deeper understanding of calculus. Through the increase of these contents, students will be more handy in the learning of follow-up courses.

## II. DETERMINE THE TEACHING CONTENT

The current teaching content of higher mathematics is based on the basic mathematical knowledge and basic computing ability required for engineering majors, mainly involving calculus. In recent years, with the deepening of teaching reform and the rapid development of individual engineering majors, the original basic teaching requirements can no longer meet the needs of discipline development. Therefore, the teaching content of higher mathematics has changed greatly. However, due to different majors, there is no unified specification at present. However, most people do not involve the basis of calculus - the basis of mathematical analysis, and rarely contain some basic contents of modern mathematics which plays an extremely important role in the development of engineering

discipline. The principle of selecting the teaching content of the pilot class of this teaching reform is not only to help cultivate students' analytical ability, but also to basically meet the requirements of students to participate in the national unified examination of human mathematics for postgraduates before graduation. In this principle, considering the training requirements of the training program of artificial intelligence specialty on students' quality and ability, we selected the fundamentals of engineering mathematical analysis compiled by Wang miansen of Xi'an Jiaotong University as the teaching material, and the mathematical analysis written by East China Normal University and the new lecture on mathematical analysis compiled by Zhang Zhusheng of Peking University as the teaching reference book. The teaching content is determined as the main content of the original higher mathematics, and the basis of analysis is added. The content includes the concept of real number definite boundary and definite boundary principle, the concept of infinitesimal analysis, subsequence, the proof of Cauchy convergence criterion and Heine theorem, the concept of uniform continuity, the proof of the property of continuous function, the concept of Riemann Integrability and the property of Riemann integral, and the proof of the class of integrable functions. In this way, the teaching content can not only meet the requirements of students majoring in artificial intelligence to participate in the national unified examination of human mathematics for postgraduates, but also meet the requirements of students majoring in this major to deeply understand the content of calculus and improve their ability of mathematical analysis.

## III. DEEPEN THE REFORM OF CLASSROOM TEACHING METHODS

The focus of the reform is to enable students to understand the background and development process of calculus content, deeply understand the essential connotation of calculus content, master basic theories, be familiar with the methods of analyzing problems, and improve students' interest in mathematics learning in understanding. Due to the contradiction between the continuous expansion of calculus teaching content and the relative reduction of teaching time, the teaching of engineering mathematical analysis is often in a situation of catching up with the progress. In the current teaching materials, the description of many calculus contents is completely opposite to the original order when the content was found, such as definite integral and indefinite integral. This makes it difficult for students to capture the idea of discovering the theory in the learning process, so they have to copy it. As a result, students' interest in learning gradually decreases with the increase of mathematical concepts. Another example is the introduction and proof of differential mean value theorem, which generally lacks geometric background analysis, especially the introduction of auxiliary functions in the process of proof, which makes students feel

"incredible" and unimaginable. Therefore, changing this situation is extremely important to improve students' thinking ability and learning interest. In the teaching of the teaching class of artificial intelligence, a lot of explanations have been adjusted, highlighting the physical background or geometric background of three concepts that emphasize the concept. When demonstrating the theorem, it emphasizes the accessibility and intuitiveness of thinking to discover the theorem, and when deriving the formula, it emphasizes the essential characteristics of each quantity reflected by the formula. For example, in the description of differential mean value theorem, in addition to introducing the geometric background of its discovery intuitively from geometry, in the demonstration, pay attention to guiding students to think intuitively from geometry, especially the proposal and demonstration of Cauchy mean value theorem. We use the function differential mean value theorem determined by parameter equation to derive and prove that when students learn, they feel that the auxiliary function is not so simple "Mystery" It is not measurable, but can be inferred. For another example, in the teaching of definite integral and indefinite integral, we still follow its original development order, first introduce the concept of Riemann Integrability and the nature of definite integral, and then introduce the relationship between definite integral and indefinite integral from the basic formula of calculus. In this way, students no longer feel that indefinite integral is just a concept in their study And a lot of difficult to remember formulas, but because of the needs of definite integral calculation, we have a further understanding and understanding of the concepts of differential and integral and the essential relationship between them, students' interest in learning has been improved.

## CONCLUSION

Since the course of "engineering mathematical analysis" in artificial intelligence specialty is still in the experimental stage, there are still many problems that need to be deeply discussed and studied. For example, how to determine the appropriate teaching content according to the training objectives and teaching requirements and improve the teaching methods needs a long time of exploration and practice. In particular, it is still a very arduous task to systematically build the course of "engineering mathematical analysis", including the construction of supporting teaching materials and teaching reference books with the characteristics of artificial intelligence, the construction of a high-level teacher team engaged in both scientific research and teaching, and a good experimental teaching environment. However, this teaching reform is very important and necessary to improve the students' mathematical quality and innovation ability.

## References

- [1] Wang M.S., Ma Z.E, Fundamentals of engineering mathematical analysis [M], Beijing: Higher Education Press, 2021
- [2] Zhang Z.S New lecture on mathematical analysis [M]. Beijing: Peking University Press, 2004
- [3] ECNU Mathematical analysis [M] Beijing: Higher Education Press, 2019
- [4] Luo J.S, Ni G.Y On the teaching reform of "engineering mathematical analysis" [J] Journal of high education research Vol 29(2) 43-45, 2006
- [5] Li Y.Y, Zhang H.F. Research and Discussion on the teaching reform of engineering mathematical analysis[J] Theory and Practice of Education Vol 34(30) 48-49 2014