

# *The Construction of University Mathematics Curriculum System for New Engineering*

Wu Yanhong<sup>1</sup>, Bai Jianxia<sup>2,\*</sup>

<sup>1</sup>Shandong Huayu University of Technology, Shandong, China

<sup>2</sup>Tianjin University Renai College, Tianjin, China

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**Abstract:** First, this paper conducts in-depth study on the connotation and characteristics of new engineering and the ability of talents required by new engineering. It creates some mathematics elective courses and network course resources on the basis of the original curriculum system, which is suitable for different engineering majors and students. The course system of "compulsory + elective + mathematical experiment +MOOC" is formed. At the same time, the content and the proportion structure of each mathematics course are reclassified according to different majors. Second, the four-in-one curriculum teaching model of "before class + in class + after class + evaluation" is established to form a closed teaching loop. Then it can make the real teaching, learning and evaluation together and a greater extent to improve students' ability to innovate, apply mathematics to solve practical problems and integrate mathematics with professional knowledge. Thus, it lays a solid foundation for cultivating diversified and innovative engineering talents.

## 1. Introduction

A new round of scientific and technological revolution and industrial transformation around the world as well as the vigorous development of the new economy sweeping the world have posed new challenges to the reform and development of engineering education. The new engineering construction is a positive response to this challenge. The proposal of "new engineering" provides a new perspective for the theoretical and practical exploration of engineering education, and is also a response to the reform and development of international engineering education in China. Since February 2017<sup>[1]</sup>, the ministry of education has been actively promoting the construction of new engineering. On April 8, 2017<sup>[2]</sup>, the ministry of education held a seminar on the construction of new engineering in tianjin university, during which over 60 colleges and universities discussed the vision and actions of the construction of new engineering. The participants agreed that it is both an urgent task and a long-term strategy to cultivate a large number of diversified, innovative and outstanding engineering and scientific and technological talents to provide intellectual and talent support for China's industrial development and international competition. Since the proposal of new engineering construction, many experts and scholars have conducted comprehensive and in-depth studies on the connotation, characteristics, concepts, framework, paradigm and implementation approaches of new engineering<sup>[3]</sup>.Some scholars have also studied the construction of curriculum system under the background of new engineering. For example, "reform of higher education

computer course teaching system under the background of new engineering";As a very important basic course for talent cultivation, college mathematics can cultivate students' critical thinking in a comprehensive way and play a crucial role in cultivating the abilities of engineering professionals. Therefore, under the background of new engineering, how to construct the new course system of university mathematics and make the organic integration of university mathematics and engineering majors is a question worthy of thinking and research. At present, there are few researches on this aspect.

## **2. Construction of university mathematics curriculum system for new engineering**

### **2.1 Open elective courses and mathematics experiment courses suitable for different majors and students**

At present, the mathematics courses in engineering colleges and universities are mainly higher mathematics. In order to better cultivate students' ability to use mathematical knowledge to solve practical problems and cultivate them into excellent talents with innovative ability, On the basis of the original mathematics courses, some mathematics elective courses and mathematics experimental courses suitable for different majors and different students' actual conditions should be set up. For example, mathematical modeling, operational research and cybernetics, advanced statistics, deep learning, mathematical experiments (Matlab, Lingo, SPSS, SAS), etc. Through the study of such courses, students can take part in various subject competitions of college students to improve their ability to solve practical problems with mathematics. It can also lay a solid mathematical foundation for students' follow-up study of professional knowledge. At the same time to promote the teaching competition, improve the quality of teaching.

### **2.2 Carry out online resource construction of online teaching sharing platform**

At present, limited by class hours, Mathematics courses offered by most engineering schools, a lot of important knowledge, There is not enough time to present to students in class, especially some knowledge with strong concept and complicated reasoning process. And these knowledge for the student's logical thinking ability and reasoning ability training is very important. This requires teachers to try to use a combination of online and offline teaching mode. Based on this, this paper redivides the university mathematics courses according to the characteristics of the content, and breaks down the knowledge points. Some theoretical and difficult to understand contents are selected and made into online courses -- MOOC and micro course. Students can choose to listen to online courses according to their own needs while learning in class. Teachers divide the teaching process into pre-class preparation, classroom implementation and after-class expansion to answer students' questions in a timely manner.

### **2.3 "Bi-dimensionality" divides the proportional structure of each course in the university mathematics curriculum system**

In the horizontal dimension, because different engineering majors have different requirements for mathematical knowledge, the mathematics courses are divided into "basic module + improvement module + application module" according to the talent training program of each major. The knowledge of the three modules will be required, elective and online self-study three different learning methods, according to the needs of students to provide different modules of knowledge learning; In the vertical dimension, each chapter of the three modules in the horizontal dimension is selected with different teaching contents and assigned with different class hours according to

students' professional needs, so as to better serve the professional knowledge of mathematics.

### **3. Under the background of new engineering, the mixed teaching mode of "online + offline" and "four-in-one" of college mathematics should be constructed**

In order to better adapt to the concept of talent training under the background of new engineering and cultivate excellent talents for modern development, University mathematics must change the original classroom teaching mode.

At present, big data and informatization have become the characteristics of modern education. In order to better transfer massive data information to students through limited class hours, college mathematics should play its due basic role in students' knowledge construction. We can choose heuristic teaching method, inquiry-based teaching method and case teaching method in the classroom of college mathematics. Meanwhile, we can assist online MOOC and mathematical experiment, which are network resources, to create a "four-in-one" hybrid teaching mode of "online + offline" and "before class + in class + after class + evaluation". The main idea of heuristic and inquiry-based teaching method is to enlighten students' thinking, cultivate their problem consciousness, encourage students to ask questions and master the knowledge in the process of exploring and solving problems. The main idea of case teaching method is to select some cases of engineering majors, combine the knowledge learned, and cultivate students' ability to use mathematical knowledge to solve practical problems.

### **4. Conclusion**

"New engineering" mainly trains innovative and excellent engineering and technology talents. The goal of "new engineering" talent training and the construction of university mathematics curriculum system should be organically combined, so that the university mathematics teaching can truly integrate with the new demands of new engineering. By building a new university mathematics curriculum system (compulsory + elective + mathematics experiment + MOOC) and applying it to the practical teaching of engineering majors, university mathematics can really lay a solid foundation for cultivating multi-directional and innovative excellent engineering talents. Take the combination of online and offline teaching mode, integration of a variety of teaching methods hybrid teaching, teachers can be more network teaching resources and advanced teaching informationization means applied in practical teaching, and improve the flexibility of students' mathematics learning style, to provide support to individualized learning, improve the teachers' teaching quality.

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