

Research of Course Teaching System Reform with the Characteristic of Light Mechanism Design

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Abstract. This paper focuses on the course teaching system reform with light mechanism design. In the training process of light mechanism design, the ability of solving practical problems and improvement of their scientific interest need to be enhanced and cultivated. Thus the existing curriculum system should be reformed. Take the course of mechanism design in light industrial mechanics department for example. Firstly, research the teaching material about mechanism design with light mechanism design and add them to teaching material and multimedia courseware. Secondly refer to and follow the famous magazine and elaborate multimedia courseware with practical light mechanism. Then, introduce the modern design and teaching methods (CAD, CAE) into the light mechanism analysis. Finally, guide students to participate in scientific research activities, and strengthen the fusion penetration of mechanism design knowledge. Using these, the ability of using Solidworks and Ansys to solve practical problems and students' scientific interest can be enhanced and improved.

1. Introduction

Zhengzhou University of Light Industry, located in Zhengzhou city of Henan province is founded in 1977, and is subordinate to the ministry of light industry of China, which is the national ministry of education pilot college education (outstanding engineers training plan) and is also only for light industry, food, electrical appliances, industrial design undergraduate course colleges and universities. Among them, light industry design is a professional institute of Zhengzhou University of Light Industry characteristics, which has a long-term accumulation of school-running. In recent years, the university has provided high quality service for enterprise, collaborated with enterprise and promoted in production-study-research cooperation education, which have realized a win-win result. Through the national major projects and provincial science and technology research projects, having cooperation with enterprises in carrying out scientific research, many excellent results have been produced [1-5]. Mechanism design is an important professional basic course in light industrial mechanics department, which studies the structure of the mechanical system, movement, transformation and the rule for transmission of force, analysis and synthesis of structural, kinematics, dynamics. Mathematics and mechanics are the main theoretical foundation, by means of computer technology and experiment, which can provide correct and effective theory and method for inventions, creating new machinery, and improving the existing mechanical design. Current "mechanism design" teaching material contents should include: the process of mechanical design; the latest development of mechanisms; the mechanism motion rule for creative design; the comprehensive of mechanical type; the kinematic analysis of mechanisms; the analytical method and geometry method for linkage mechanism; space connecting rod and the robot mechanism; CAM mechanism; planetary gear train; the synthesis and combination way for combined mechanism. The course of mechanism design is an important improvement and further development of mechanical

principle, which is also the starting point for mechanism innovation design, automatic mechanical design, packaging machinery technology and equipment and other courses. Thus, the innovation consciousness of students in the design process should be strengthened and the ability of its innovation ability and comprehensive application of knowledge should be trained. The effective interaction between teaching and learning needs to be formed, and the enthusiasm of teachers and students is also very important. From this point, the teaching reform of mechanism design course with the characteristic of light mechanism design should be actively explored [3-5]. The main content of the curriculum reform is divided into five parts. Firstly, the teaching material about mechanism design with light mechanism design is studied and added to teaching material and multimedia courseware. Secondly the famous magazines can be referred to and followed, and practical light mechanism is elaborated in multimedia courseware. Then, the modern design and teaching methods (CAD, CAE) is introduced into the light mechanism analysis. In the following section, we will give a detail explanation.

2. Teachers should actively research the teaching material about mechanism design with the characteristic light mechanism design at home and abroad and added them to multimedia courseware.

Study the content and features of similar materials about mechanism design with the characteristic light mechanism design at home and abroad, Build teaching material about mechanism design with the characteristic of light mechanism design and keep steep with advanced teaching materials at home and abroad. Add these to the teaching textbook and multimedia courseware. Moreover, add a lot of practical examples about mechanism design with the characteristic of light mechanism design, such as the real photos of actual packaging machine (or structure), or details of whole or partial structure of the actual product, and some computer programs about mechanism design to deepen the understanding of the course and students' practical application ability. In this section, we should care more about the teaching material of mechanism design with the characteristic light mechanism design at home and abroad using modern design means and methods, such as using three dimensional simulation analysis software (Ansys software, Solidworks software) to model simulation movement.

3. Refer to and follow the famous magazines about mechanism design at home and abroad, to enhance students' innovation ability and interest in scientific research.

The teachers should search the articles about analysis and synthesis of mechanism design in Mechanism and Machine Theory, Journal of Mechanical Science and Technology, Chinese Journal of Mechanical Engineering, Journal of Mechanical Design et al. The students should be encouraged to divide into groups, translate the articles, deduce the formula and implement the programming, which enables students to contact the latest scientific advances of the content in this course, and combine with characteristic of mechanism design. Due to the mechanism design is a comprehensive discipline, the students' programming ability is needed to train on the basis of understand the theory. According to the requirements of the educational reform and the need of curriculum construction, on the basis of the existing teaching materials, a detailed discussion on the structure of the mechanical system, movement, transformation and the rule for transmission of force and analysis and synthesis of structural, kinematics, dynamics should be given, and the design idea and program flow should be introduced. Also the contents of mechanism design and computer programming are combined. In order to strengthen students' understanding of the comprehensive theory of mechanism motion analysis, guide the students to study the three dimensional simulation analysis software, such as Ansys, Solidworks, et al. On the basis of the three-dimensional entity model CAE analysis, finish the analysis of comprehensive and its motion. Based on these, guide the student to use computer language such as VC and Matlab to solve the problem of specialized subject by computer aided analysis and synthesis, and further enhance the student's understanding of agency theory and cognition

4. The production of multimedia courseware of mechanism design with light industry couple with computer program, CAD and CAE simulation analysis

Emphasizes the integration of information technology and course content (the combination of theory with practice), such as the real photos of actual organization (or structure), some of the details of whole or partial structure of the actual product and computer program which is used for the corresponding mechanism, the result image of CAD and CAE software using for the corresponding mechanism and the using of CAD and CAE for analysis of actual structure. Applying the Internet and multimedia technology, keep that the teaching content is scientific, advanced and interesting, through the corresponding video and text, to make the students understand the mechanism design of product development present situation at home and abroad. To strengthen the real-time communication of students and teachers, solve the problems in the process of students learning timely. Guide the student to solve in the actual problems encountered in mechanism design, accumulate practical experience, and lay a good foundation for future work. In this section, we should emphatically introduce the CAD to design the mechanism models, and CAE to simulate and analyze the mechanism structure, and how to analyze the mechanism models by computer program and compare with CAE software.

5. Design visualization system based on CAD/CAE software to improve the students' scientific interest

This part considers that the students establish the mathematical model, grasp the kinematic analysis, finish comprehensive theoretical analysis and harmonic trapezoid motion of CAM mechanism, using three dimensional simulation analysis software (Ansys software, Solidworks software) to model simulation movement, to determine the initial position and size and analyze mechanism motion synthesis process. Through programming software to compile and debug program for mechanism motion analysis and comprehensive analysis procedures, finish the crank existence conditions, interference, other motion and dynamic simulation. Using VC and Matlab program for the 3d simulation software (Ansys, Solidworks) secondary development compare and research the results. All the related mechanism design theories are integrated into automatable design and can be developed by visualization using computer software, and introduced into teaching and research activities. The system plan is divided into four sub-topics, which includes: bar linkage mechanism analysis and synthesis system; CAM mechanism analysis and synthesis system; intermittent motion mechanism analysis and synthesis system; combined mechanism analysis and synthesis system. Designers should try to make it as long as that the input parameters are obtained, and the software system can be carried out by automation design in the 3d simulation analysis software for mechanism motion simulation, and output the component structure. Combine the theory of mechanism design with modern design means and methods. Using the modern design means and methods, the ability to solve practical problems of the students can be cultivated and scientific interest and manipulative ability can be improved.

6. Actively guide students to participate in teachers' scientific research activities and strengthen the fusion penetration of mechanism design knowledge

In scientific research activities, a variety of knowledge fusion penetration is required usually, which needs to strengthen the students' knowledge learning, and the students' understanding of mechanism design. In addition, in the process of graduation design, the teacher can also arrange with light industry characteristics and combine these with practical subjects closely about mechanism design, training students' ability to solve practical problems. This part can improve the students' ability to solve practical problems and manipulative ability to do scientific research.

7. Conclusion

In the teaching life of future work, teachers of Zhengzhou light mechanics department will combine theory of classic mechanism design with modern design method (Taking CAE analysis technology (3d simulation software Ansys, Solidworks software) as the main line). Starting from the angle of the system and students' cognitive rules, add, integrate and improve the curriculum system, teaching content using the modern means and methods. In the course teaching, strengthen the practical application of curriculum theory, cultivate theoretical knowledge learning and improve students' interest, and combine product organizations and domestic advanced theory by theory and practice. In curriculum organization, emphasize the integration of information technology and curriculum content, and use network and multimedia technology keep that the teaching content is scientific, advanced and interesting. Based on modern design method and means, the computer aided technology can be also combined with mechanism design, computer programming, to exercise the students to apply the program and the ability of 3d simulation software (Ansys software, Solidworks software) to analyze practical problems. Train the students' innovation consciousness, innovation ability and the ability of comprehensive knowledge for practical problems, and form a good interaction and enthusiasm between teaching and learning motivation. These will help us finish a perfect reform of mechanism design with the characteristic of light industry.

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9. References

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