

# Construction and Application of High-quality Online Course for Advanced Fluid Mechanics

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**Abstract:** The main purpose of constructing the graduate network course is to realize the innovative student teaching and network teaching mode and adapt to the modern teaching style. Advanced fluid mechanics construction of online courses, mainly from the teaching course construction, ideological construction and evaluation way innovation, combining with the advantages of traditional offline teaching, emphasize the interaction between teachers and students, emphasize students participation in the curriculum, the purpose for students to better understand advanced fluid mechanics, and through the case of fluid mechanics, strengthen the students ability of scientific dialectical thinking, cultivate the ability between theory and practical application.

**Keywords:** advanced fluid mechanics, graduate online course, course construction

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## 1. Background of Online Course Construction

With the promotion of the 14th Five-Year Plan, the reform direction of higher education is combined with the planning vision, and digital textbooks and online courses are gradually applied to the field of education. Therefore, the global outbreak of the epidemic has further developed and practiced online education<sup>[1]</sup>. In order to adapt to the development of society, economy and science, the Ministry of Education has also proposed the construction of online courses with characteristics, break the traditional teaching mode, not limited by time and space, rely on students independent learning ability to realize network shared teaching.

Advanced fluid mechanics is an important technical discipline, with fluid mechanics as the carrier, through the analysis of the problem to cultivate the students innovative spirit, fluid mechanics in undergraduate stage focus on learning the basic principle of macro fluid motion, mainly including continuous equation (conservation of quality) and momentum conservation of N-S equation, is given priority to with one-dimensional flow analysis, the key to solve the problem is the mathematical tools. Advanced fluid mechanics is as a graduate professional course, is further explore the problem of nonlinear and complexity, to analyze the macro three dimensional fluid motion law<sup>[2]</sup>, the basic theory and concept of various, involving formula derivation complex, has strong systematic and logical, learning hard, need to have a solid mathematics, physics, mechanics, and knowledge of the description of three-dimensional fluid motion law of higher order equations, there is no analytical solution. Therefore, in teaching, it mainly focuses on the derivation of formulas and the solution of classical problems, so it involves the derivation of complicated formulas, and makes the theoretical knowledge learned can not be combined with the reality, so that the course teaching cannot meet the target requirements. This course has a strong foundation and is in line with the characteristics of engineering graduate student training. Strengthening the course construction plays an important role in improving the teaching quality of graduate students, improving the teaching level and effectively helping students to better understand this course. Under the existing teaching team, the new teaching methods have a great impact on students learning and teachers teaching, traditional teaching methods are mainly one-way teaching, unable to go deeper, can satisfy students comprehensive understanding of theoretical knowledge, unable to be more fully integrated with practical engineering applications, nor can it meet the needs of cultivating innovative talents conforming to the new era<sup>[3-4]</sup>.

## 2. Curriculum Construction Content

### (1) Curriculum Construction Ideas

The construction of higher fluid mechanics online course is in developing the development of the Internet teaching mode environment, combined with related online course successful cases, during the outbreak of network teaching cumulative experience, the guidance of national quality course construction, fully consider online teaching content required, build training conforms to the new era of innovative talents teaching mode, to improve the graduate education level to provide high level teaching and platform, to the content of the construction of online course, and explore as follows.

The traditional course of advanced fluid mechanics, as a professional course of engineering, is the expansion and extension of fluid mechanics. It is mainly based on the law of conservation of mass and the law of conservation of momentum, to explore the balance relationship and the law of fluid motion. Fluid is

everywhere, and it can be imagined that fluid involves a wide range of aspects, and must be related to other disciplines, so higher fluid mechanics plays an important role in graduate courses<sup>[5]</sup>.

Combined with the current development status of online courses, building an online course in advanced fluid mechanics, not only has a profound impact on students fuller understanding of theory and practical applications, but also plays a promoting role in the teaching of advanced fluid mechanics courses. Combined with rain class, cloud class, MOOCs and other related learning software, mainly divided into three stages. The first stage is the pre-class preparation stage, the teacher can release the preview content in advance, set up the little questions for this lesson. For the students to think about in advance, the instructor may also add additional research content related to the course content. The second stage for the online teaching stage, teachers online teaching, can generate playback video at the same time, convenient sharing and review, have the right learning perspective and viewing experience, teaching video with open real-time barrage, teacher questions, students timely feedback, ensure barrier-free interaction between teachers and students and teachers, the teacher convenient and timely answer, increase online classroom interest, teaching content unit division section, teachers can each section can decorate preview content, thinking, expand teaching related research content, through a series of tasks, to ensure the coherence of the course, also ensure the learning content of systematic and comprehensive<sup>[6]</sup>. The third stage is the after-class discussion and exercises, video setup discussion area, students can speak freely about the problems or ideas existing in the learning process. While focusing on theoretical study, combined with the actual engineering content or the experimental content, or combined with the case libraries, using a scientific and dialectical way of thinking, analyze the differences between practical engineering and theoretical knowledge of<sup>[7-8]</sup>.

In general, after the establishment of a complete online curriculum system, still want to emphasize the students autonomous learning and thinking ability, need to online course link as much as possible involved, relatively foreign network course, the online course advantage is the interaction between teachers and students, and teachers of course related research content share and explain, set by the teacher discussion plate, such as discussion through learning platform, social software to establish communication group, etc., the construction of the higher fluid mechanics related virtual simulation course construction, let students immersive understanding of all kinds of fluid, and all kinds of fluid phenomenon.

## **(2) Comprehensive Whole-Process Assessment Method**

The assessment method of curriculum reform is also particularly important. The examination result system of traditional teaching is relatively single, which cannot form a comprehensive assessment system, which is difficult to meet the needs of cultivating higher innovative talents in the new era. Therefore, it is particularly important to seek the assessment method of higher education in line with the theme of the new era. The higher mechanics online courses to break the traditional way of assessment, students usually participate in the course discussion, homework completion of the participation in the whole teaching process, and the final test after the course, will be as the examination content, for the whole course content, the proportion of each part cannot too large, mainly to examine the core of the course always, avoid top-heavy, also can add the examination of the experimental part, pay attention to the practical part. The final test part is not only the content of the test, but also the large homework in the form of the paper, which can be analyzed through the large homework, while the large homework should focus on the comprehensive ability of students and the investigation of students ability to analyze problems.

## **(3) Integrate Ideological and Political Elements Teaching Organically**

Postgraduate education is more professional, emphasize the cultivation of students scientific and dialectical thinking ability. Students at this stage have greater ability to think independently. A stronger sense of independence and mature values and worldview, according to the policy of ideological and political construction. The core task of education is also to educate students. Teaching and human people integrate, skillfully integrate ideological and political elements into the classroom, and cultivate new youth in line with the new era, with patriotism, professional ethics, responsibility and responsibility<sup>[9-10]</sup>.

## **(4) Collect Teaching Feedback**

The teaching team has a summary of each class, solve problems in time, make up for them in time, and prepare for the subsequent online courses. The teaching team can enrich the course content, increase teaching cases, and timely communicate with students to ensure students class experience. At the end of the course, the teaching team summarizes the problems in the teaching process, makes a final summary of the online course through the discussion between the teams, and prospects the updates of the subsequent courses in the later class.

### **3. Conclusions**

Graduate stage of online course is still in the early stage of construction, compared with other successful cases, online course teaching content to do professional, comprehensive, and combining the students actual experience, improve the curriculum, course also emphasizes the ideological construction, education reform, use of modern information resources, reform the course construction, strengthen the construction of student innovative, strive to meet the needs of the new era of higher personnel construction of online courses.

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