

Curriculum Reform of Signal and System based on the Integration of Truth and Reality

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Abstract

The traditional signal and system teaching focuses on teaching book knowledge, ignoring the cultivation of skills and abilities. It is difficult to form organic integration in teaching objectives, teaching contents and teaching methods. This kind of teaching mode hinders the cultivation of highly skilled talents, and the students who are cultivated are easy to disconnect theory from practice. At present, the traditional teaching mode can not support the needs of application-oriented colleges and universities. Based on the idea of running an application-oriented university, the reform design of combining truth and reality is carried out. The teaching mode of combining theory with practice breaks the boundary between traditional theory and practice, and integrates theory teaching with practice. Effectively improve the quality of teaching, quickly train qualified skills needed by the society.

Keywords

Signal and System; Fusion of Truth and Reality; Teaching Reform; Teaching Means.

1. Research Significance

With the development of our society and the progress of science and technology, all industries and fields in the future need high-quality compound talents with strong engineering practice ability and innovation ability. Signals and systems is a course that combines signals and systems through rigorous mathematical formulas and practical engineering project applications, and expresses them in the form of graphics, so as to reveal the basic concepts of signals and systems and their corresponding physical meanings and connotations. The course of Signals and Systems has many contents, abstract theories and complicated mathematical formulas. In the teaching process of this course, if the traditional single classroom teaching method is used, it is easy to cause problems such as boring content and weak application, so it is difficult to get good teaching effect in the limited teaching hours. Under the current applied personnel training requirements, it is particularly important to how to improve students' comprehensive application ability, to stimulate the students' learning potential, improve the students' interest in learning, and the perspective of cultivating students' practice ability, we in the traditional teaching methods, teaching means and the experiment teaching and so on to explore new development direction, practice the teaching reform based on the principle of solid fusion scheme, This kind of problem can be effectively solved.

2. Status Analysis

For the course "Signals and systems", from the teaching practice in recent years, it is found that many students are still too much immersed in the tedious mathematical operation and derivation, and lack a profound understanding of the theory, especially the background of engineering application, and incomplete grasp of the concept. Therefore, it is difficult for students to effectively combine signal transformation and systematic analysis through examples. The traditional teaching mode still adopts this kind of driving teaching method, the

theoretical knowledge is disjointed with the practical application, and it is difficult to reach the final teaching goal stipulated by the curriculum. Therefore, it is urgent to reform the teaching methods and means of "Signals and systems" course.

2.1. Current Situation and Existing Problems of Curriculum before Reform

2.1.1. Abstract Contents and Concepts Cause Students' Resistance

For applied undergraduates, their mathematics and physics foundation is relatively weak. However, in the teaching process of signal and system courses, there are many mathematical and physical formula derivation, and many abstract and difficult concepts need to be mastered. If only the indoctrination and explanation of theoretical knowledge points are emphasized, it will be difficult for students to understand and master the abstract concepts. There will be resistance to learning this course, so it can not achieve a good teaching effect.

2.1.2. Spoon-feeding Teaching Method Cannot Guarantee the Teaching Effect

Traditional classroom teaching is mainly "spoon-feeding" teaching, easy to lead to the distraction of students' attention in class. The course of Signal and System focuses on specific knowledge and theory, which is "boring" and difficult to learn. Compared with professional courses, students lack enthusiasm and confidence in learning. If students do not timely digest and understand the new knowledge points, it will have an impact on the learning of the following chapters.

2.1.3. The Traditional Teaching Mode Lacks Practice

The traditional teaching mode takes the theory class and the practice class separately, is used to learn the theoretical knowledge first, then carries on the experimental verification or the specialized skill operation training. Due to the lack of perceptual understanding of knowledge, students can only "rote memorization" of abstract professional knowledge, "vaguely understand". In the stage of professional skills training and teaching, although students are more interested in professional skills, they have forgotten a lot of professional theoretical knowledge and cannot form systematic comprehensive skills, resulting in students losing their enthusiasm for professional learning.

2.2. Teaching Method Reform Measures for the Above Problems

2.2.1. Introduce the "Flipped Classroom" Teaching Method Combining Classroom Teaching and Online Teaching

Teaching method reform is the core of the whole curriculum reform. In the signal and system teaching method, students as the main body, teachers as the leading, carry out interactive teaching. Successive before on the one hand, teachers team members through summarizing the problem of students in learning, to develop a need to flip the learning content to students, actively mobilize the students' interest in learning, to take the student as the main body of online learning, the traditional process over teacher lectures, classroom into a place for interaction between teachers and students, It is mainly used to answer doubts, report and discuss, so as to achieve the teaching effect of activating the classroom atmosphere and increasing students' enthusiasm for independent learning.

2.2.2. Integrate "Rain Class", "Cloud Class" and Other Teaching Methods

In the teaching of the full use of modern information technology means, the use of "rain class", "cloud class class" and other teaching means to further promote the close communication between teachers and students, improve students' participation in the classroom, to make students become the subject of the classroom. With "Rain Class" and "cloud class", teachers can push preview micro lessons and video materials before class, which is convenient for students to check learning content in time. In class, I push PPT and exercises to guide students to think and talk, and actively report and display their own works and practical achievements. After

class, students can also be organized for further discussion and communication, and personalized counseling to answer questions. Blended classroom teaching promotes classroom interaction, increases the time and opportunities for communication between teachers and students as well as between students and students, and stimulates students' excitement in class to a great extent.

2.2.3. Strengthen Students' Engineering Literacy and Ability to Solve Practical Problems

In the course of teaching, teachers should try their best to express abstract theoretical problems vividly with the help of tools. For example, when teaching "time-domain sampling characteristics of signals", on the one hand, this characteristic is explained according to the basic principle of frequency domain analysis characteristics of continuous time signals; on the other hand, a certain song signal $X(t)$ can be edited and produced by taking common popular songs as an example, and $x(2T)$ and $X(T/2)$ signals can be obtained by MATLAB software programming. Let's listen to the difference between $x(t)$, $X(2t)$ and $X(t/2)$ sound quality. The combination of practical examples and theoretical knowledge can not only adjust the classroom atmosphere, make students better understand the content of the classroom, but also improve the interest and enthusiasm of learning.

2.2.4. Carry out Diversified Counseling and Q&A

In order to improve the teaching effect of the course and stimulate students' interest in learning, counseling and answering questions is an effective auxiliary teaching method. Considering the students' learning level is uneven, it is necessary to take diversified forms of after-class q&a in order to achieve better tutoring effect. Adopt a combination of weekly personalized individual q&a and monthly intensive Q&A. After class, the interaction between students and teachers will be increased to timely find and solve students' mistakes and problems in learning the course, so as to ensure that students can step into regular learning and effectively ensure the teaching effect of the course.

2.3. Teaching Means Reform Measures for the Above Problems

2.3.1. Carry out Diversified Information-based Teaching

In teaching reform, we need to attach great importance to the improvement of teaching means. The course of "Signals and systems" involves a lot of formulas and theoretical derivation, and the traditional teaching methods focus on theoretical knowledge teaching. Therefore, it is necessary to increase the application of curriculum knowledge and systematic practice teaching. We need to grasp some key, but complex abstract theorems and laws, using software simulation or play demo animation and other ways, vividly show the process and results of signal processing. Intuitive simulation image changes and vivid animation demonstration can make students intuitively and vividly understand abstract theoretical knowledge, and deepen their understanding of teaching content. For example, when explaining the signal sampling theorem, in addition to the traditional explanation and conclusion deduction, video animation will also be used to demonstrate the sampling interval changing from small to large in the sampling process, so that students can watch the whole process of spectrum from unaliasing to aliasing. The students were impressed and deepened their understanding of the key points. The understanding of difficult knowledge also stimulates their interest in further study and exploration.

2.3.2. Reform of Integrated Teaching of Theory and Practice

The training of applied talents requires the combination of theory and practice, and practical teaching is particularly important. The traditional teaching mode should aim at improving the students' comprehensive quality and the ability of combining theory with practice, and focus on cultivating students' innovative spirit and ability. In the process of achieving and realizing

this goal, the integration teaching reform which combines theory with practice plays a key role. The practical teaching of signal and system is mainly carried out from the following aspects: one is the generation of simple signals, familiar with the use of Matlab software, master signal expression methods and use Matlab to generate signals and achieve signal visualization. Second, the convolution operation of continuous time signal, proficient in using Matlab to realize the convolution operation of continuous signal and the visualization of convolution. The third is sampling theorem, let the students understand the significance of sampling theorem, that is, in the process of converting continuous time signal to discrete time signal, sampling is needed to ensure that the signal without distortion to restore the original appearance.

3. Summary

Through the implementation of the reform plan, students' initiative and enthusiasm in classroom learning will be further improved, so that the learning of signal and system is no longer boring and difficult. Further deepen students' understanding of the theoretical knowledge of the course, improve students' practical ability and innovation ability.

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