Practice of Applied Optics in Applied Physics

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Abstract: As the core technology basis of information optics, applied optics mainly studies the independent propagation of light and refraction laws. In the whole optical system, it tracks the optical path, and studies how the optical system is imaged and the basic characteristics shown by its imaging. In addition, the application and design of optical systems are deeply studied.

1. Introduction

By learning “applied optics”, students can understand how light spreads through different media, solving the basic optical technology problems in photoelectric engineering. In addition, students who complete the course can have a deeper understanding of the development of optics and how photoelectric technology is applied. Therefore, Applied Optics is an important basic theory course for the courses such as Modern Optoelectronics, Optical Information Processing, Optical Fiber Communication, and Photoelectric Sensor Technology.

2. Content and Characteristics of “Physical Optics and Applied Optics”

“Applied optics” courses have long been offered in various universities. Its content covers: the propagation law of light in isotropic and anisotropic medium, optical interference, optical diffraction, geometric optics, ideal optical system, aberration basis of optical system, optical instruments and so on. From practical teaching experience, students find it very difficult to learn this course. The main reasons for this are as follows: first, the optical knowledge involved by students in middle school is too simple, Compared with the university's “applied optics”, the knowledge span is too large; second, Physical optics theory is closely related to some difficult mathematical knowledge, third, Applied optics exists a large number of cumbersome and complicated concepts and formulations, And it is very abstract, Lead to students, difficult to remember; fourth, The derivation of the mathematical formula in this course is quite complicated, Make students have fear and lose interest in learning; fifth, The Applied Optics course is purely theoretical, Lack of corresponding experiments; sixth, Teaching materials and classroom teaching practice and practical frontier techniques are out of touch with each other, Make it impossible for students to apply it in practice, So that teachers must study the course in depth, To find a targeted teaching method, Mobilize students' interest and enthusiasm in the course of optical application, To improve the quality of the teaching of the course.

2.1 Second, Improve the Teaching Content and Methods

As a teacher must first be aware of the importance of the “applied optics” course, through analysis can know that the course has theoretical, abstract characteristics, to ensure that students' enthusiasm of “applied optics” course learning, related teachers must scientifically adjust the teaching content, teaching methods, to the practice. First, adjust the teaching content. Since 2007, ZEMAX optical design software has been introduced into practical instructional classes. By learning the content of this part, students can design some simple single lens and double single lens independently, so that students' practical ability can be improved, and can properly help to understand the relevant concepts.

3. Adjust the Teaching Methods Appropriately. in the Optical Part.

some complex mathematical formulas try to reduce or not, and pay attention to the interpretation of physical ideas: the mathematical derivation of physical optics is often complex, tedious and boring, which requires a lot of classroom teaching time, and it is easy to frighten students. Therefore, the mathematical derivation should be simplified, do not require students to master the complex mathematical derivation formula, requiring students to effectively analyze the relationship between the reflection coefficient, transmission coefficient, reflectivity, transmittance, incidence angle and refractive index on both sides of the interface. For example, in the effective analysis and explanation of the Michelson interferometer, Mach-Zengdel interferometer and Fabri interferometer, students can easily have a deeper understanding of the actual work of these three different forms of interferometers and how to apply them in practice. In the process of explaining the diffraction problems, teachers can guide students to effectively compare the experimental device of single peak diffraction, round hole diffraction, rectangular hole diffraction and multi-crack diffraction and explain it scientifically. Students will understand them on the basis of comparing them, in geometric optical imaging problems, comparing single-spherical refraction, spherical reflection, and lens imaging, including the imaging formula and focal length expression and magnification formulas. In the optical instrument section, the magnification of the magnifying glass, microscope and telescope is compared, which is more conducive to the students' understanding, memory and application of the formula.

3.1 In the Actual Courseware Making Process, If the Phy3d Demonstration Can Be Added Appropriately, Then It Will Produce Unexpected Results. for Example.

To explain the principle of the concave lens, the principle of phy3d, in the process of actually derithe imaging formula. These make arbitrary changes to the object distance, image distance, or focal length. During the imaging process of these systems, students can make intuitive and deep observations based on the relationship between object distance, image distance and focal length. For another example, for the description of the Michelson interferometer, under the 3D demonstration, the students clearly observe the propagation process of light. By adjusting the distance and position of the two mirrors, the changes in the interference pattern can be clearly seen, which greatly improves the students' understanding ability. The obstacle that students have been unable to overcome is to understand the diffraction of light, so under the phy3d demonstration, students can clearly see the change of the diffraction pattern when the obstacle size changes.

3.2 Strengthen the Practical Teaching Link. to Cultivate Compound and Practical Talents.

Only when students master the actual work skills, students will get effective development and promotion opportunities in the future work, which is also crucial for students, In order to pay attention to the cultivation of students' practical ability in the practical teaching process, and spend more time in practical teaching.

3.3 Reform the Content and Method of the Examination, Pay Attention to Knowledge and Intention

Everything should be based on the core of the students 'ability and intention, for some concepts, application and judgment to ensure its combined with the graphics, in setting related problems, to ensure that the problem of open principle and discussion principle, for a volume of general review of optimization and improve, using diversified learning methods for students' actual ability to detect and training, timely check 20.

4. Reform Prospect of Applied Optics.

To ensure that the introduction of the actual teaching demonstration experiment, in the process of the laboratory equipment into the actual demonstration process, to ensure that in the actual experiment process, students to some typical optical system for a deep understanding and contact, to ensure that students into the actual job can find their own place. Secondly, some basic knowledge of

modern optics is introduced in the course, and some latest optical development states and scientific research achievements are integrated into the teaching materials, so that students can keep up with the development trend of science and technology.

This can not only expand students 'basic knowledge, but also broaden students' vision, so as to stimulate students' interest in learning. At the same time, students can understand the overview and development trend of the frontier of the subject, and create an effective scientific knowledge structure for students. In view of the preview homework and homework to be reserved, in view of the actual teaching process of some difficult to solve the teacher to help students timely decomposition and digestion, in the actual teaching classroom, ensure the diversity and effectiveness of teaching methods, so as to effectively solve the practical key and difficult problems, at the same time should pay attention to cultivate students' cooperative learning ability, to ensure that students have independent learning and thinking space. Give full play to the means of information technology, organically integrate the traditional teaching methods and modern teaching methods, and fundamentally improve the teaching effect. For the key points and difficulties existing in the teaching process, the CAI courseware, video and network resources are used to improve students' better understanding of knowledge, so that the teaching content can be mastered by students. Fifth, when all the teaching tasks have been completed, according to the different needs of students, the relevant knowledge can be expanded accordingly, not only consolidate the knowledge, but also improve students' practical ability and brain, consolidate their future employment foundation.

5. Conclusion

In order to ensure the better development of the optical classroom, teachers can use diversified teaching methods to discuss the key and difficult issues, so that students' innovative spirit and independent learning ability can be cultivated. Make full use of the modern information technology means, organically combine the traditional teaching means and auxiliary teaching means, and fundamentally improve the teaching effect.

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