

# Exploration and Practice of Laser Processing Practice Teaching

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**Abstract.** In order to comply with the development of the new situation, the quality of engineering practice teaching will be improved. In-depth study for the construction of the laser processing practice teaching, respectively from the construction ideas, construction content and implementation process of three aspects to explore, which provides reference for the construction of the laser processing practice teaching in other universities.

## 1. Introduction

Engineering training practice teaching is an important teaching link in colleges and universities, which plays an important role in cultivating students' engineering awareness, engineering practice ability, and innovation consciousness [1-5]. The university's engineering training curriculum system is constantly reforming and innovating. It has gradually expanded from traditional practice teaching models such as turning, fitters, milling, planning, and grinding to CNC turning, machining centers, and 3D Modern advanced practical teaching modes such as printing, flexible manufacturing production lines, coordinate measurement, robotics, etc., strengthened the practical teaching content of new materials, new processes, and new technologies, paid attention to multidisciplinary integration, and focused on cultivating students' engineering awareness and innovative spirit[6-7].

Laser processing involves many disciplines such as optics, mechanics, electronics, and materials science. It is a comprehensive modern advanced manufacturing technology [8-10]. Laser processing is non-contact processing, which does not require the use of tools in traditional manufacturing technologies. Compared with traditional processing and manufacturing technologies, laser processing has the advantages of small cutting gaps, smooth cutting surfaces, and thermal deformation, and solves many conventional methods that cannot be solved or are difficult. The problems solved have greatly improved the processing efficiency and processing quality.

To adapt to the development of the new situation, our center has set up a laser processing practice teaching module. This article mainly introduces the construction ideas, construction contents and implementation process of the laser processing practice teaching module.

## 2. Teaching Objectives

Understand the development, principle, processing scope and application of laser processing, and understand the processing principle and technological characteristics of laser hybrid cutting machine, laser high-speed cutting machine, laser marking machine, and laser engraving machine; the laser marking machine, laser engraving machine operation training; observe the operation of the laser hybrid cutting machine and laser high-speed cutting machine. Through practical training of laser processing, students will be able to understand the relevant knowledge of special processing in advanced manufacturing technology and lay a good foundation for the follow-up theory course.

### 3. Teaching Construction

#### 3.1 Teaching Document Construction

(a)Syllabus. The practical syllabus is the guiding document for practical teaching of engineering training. The laser processing practice teaching module sets 8 teaching hours for students majoring in mechanics, materials, autos, food, and management. Laser processing practice syllabus sees Table 1.

Table 1. Laser Processing Practice Syllabus

No.	Content	Time
1	Understand the development, principle, processing scope and application of laser processing.	0.5 hours
2	Understand the processing principle and process characteristics of laser hybrid cutting machine, laser high speed cutting machine, laser marking machine, and laser engraving machine.	0.5 hours
3	Performing practical training on laser marking machines.	3 hours
4	Carry out the practice training of laser engraving machine.	3 hours
5	Observe the operation of laser hybrid cutting machine and laser high speed cutting machine.	0.5 hours
6	Practical teaching instructors organize student group discussions, analyze the causes of laser marking processing and laser engraving processing defects, and propose corresponding solutions to analyze and summarize the practical operation process.	0.5 hours

(b)Teaching material. "Modern Engineering training" in engineering training series is designed to guarantee the teaching quality of engineering training in modern advanced manufacturing technology teaching content and to improve the students' engineering practice ability.

The guiding ideology of compiling this teaching material is better service engineering training practice teaching, paying attention to the scientific and integrity of knowledge. The contents of the teaching materials accordance with the requirements of the syllabus of practical teaching, lay stress on practicability and pay attention to the combination of theory and practice. In the process of writing, we should make efforts to be clear and clear, the language is concise, the graphic and the text are perfect, and the structure is reasonable. Modern Engineering training of Engineering Training Series plays an important role in the teaching quality of laser processing practice.

(c) Practice teaching. According to the teaching requirements of laser processing in the syllabus, the teaching plan of laser processing practice is compiled. After the application of the teaching plan, the explanation of laser processing knowledge in practical teaching is standardized, and the mistakes and omissions of the knowledge in the teaching process are avoided because of the different opinions of the practical teaching staff on the relevant contents of laser processing. Thus, standardization of laser processing practice teaching process and the teaching requirements of laser processing practice teaching syllabus are ensured.

(d)Practice instruction. In order to enable students to master the relevant knowledge and operation steps of laser processing equipment systematically and accurately, and to be able to use laser processing equipment safely and correctly to process parts that meet certain technological requirements, the guide book of laser processing practice has been compiled.

(e) Practice report. In order to examine the theoretical knowledge and equipment operation skills of students in laser processing practice teaching, and to deepen the understanding and memory of laser processing theory knowledge and equipment operation skills, the report on Laser processing practice was compiled. The report uses a wide range of questions, such as judgment, multiple choice, blanks, short answers, analytical questions, etc.

### **3.2 Teaching Hardware Construction**

According to the construction and acceptance standard of Engineering Training Teaching Demonstration center, combined with the requirement of laser processing practice syllabus. Hardware of laser processing practice teaching mainly includes: 1 laser mixing cutting machine, 4 high-speed laser cutting machines, 4 laser marking machines, 5 laser engraving machines, 1 camera, 32 computers.

### **3.3 Teacher Construction**

Laser processing practice teaching takes researcher level senior engineer as an academic leader, which has a strong acceptance the new technology, new craft, new equipment able graduate student as front-line practical teaching instruction personnel. First-line practice teaching guide staff via post appointment and competition, at the end of each semester to the front-line practice teaching staff assessment.

## **4. Teaching Process Implementation**

Under the guidance of laser processing practice syllabus, on the basis of following the students' cognitive laws, there is a planned, phased design of laser processing practice teaching content, from shallow too deep for laser processing practice teaching.

The practical teaching personnel use multimedia courseware to explain the development, principle, processing range and application of laser processing in various fields; Laser mixing cutting machine, laser high-speed cutting machine, laser marking machine, laser engraving machine processing principle, process characteristics; The basic process of laser processing; The practice instruction personnel unifies the picture to explain a laser marking pattern design flow and the main points, the practice teaching instruction personnel according to the laser marking machine's operating procedure explanation and carries on the demonstration operation, the emphasis safety attention matters, then the students according to the operation step carries on training; The practice instruction personnel unifies the picture and so on to explain a laser inside engraving machine design flow and the main points, the practice instruction personnel according to the laser internal engraving machine's operating procedure explains and carries on the demonstration operation, the emphasis safety attention matters, then the students according to the operation step carries on the training. After processing, students need to discuss the process of laser marking, laser engraving process analysis and summary, the main analysis of laser marking, laser engraving processing of the causes of defects and put forward corresponding measures to solve; Finally, the students must complete the laser processing practice report independently according to the practice report request and the discussion result.

## **5. Assessment and Achievement Evaluation**

Laser processing practice teaching adopts the procedure assessment model. The final achievement of the students is composed of two parts: the engineering practice and theoretical knowledge assessment. The two respectively account for 80% and 20% of the total score. Laser processing practice results consist of three parts. The attitude is 10%, the laser processing practice report is 20%, and the laser processing operation training is 70%.

## **6. Conclusion**

The construction of a laser processing practice teaching module allows students to understand the development of advanced manufacturing technologies and the basic knowledge, principles and applications of advanced manufacturing technologies so as to improve the quality of practical teaching. This article describes the teaching construction plan of the laser processing practice in detail, and it provides a reference for the construction of laser processing practice teaching for other college.

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