

## Application of Engineering Education Model Based on EIP-CDIO in Analog Circuit Classroom

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**Abstract.** In today's society, the rapid replacement of information, enterprise demand is also changing. Facing the contradiction between many enterprises unable to find satisfactory talents and university graduates unable to find the right job, the university classroom is facing a major reform. We must recognize the reality, to improve the students' conception, design, implementation and operation ability, the ability of college students will be divided into four levels of interpersonal ability and team ability of engineering system engineering basic knowledge, personal ability, and the requirements of engineering education mode to cultivate comprehensive manner to enable students to achieve enterprise standards in the four aspects. Enterprise feedback information shows that we have a lack of professional ethics education, so we should emphasize the importance of professional ethics while we are in the process of CDIO reform. Here, a new EIP-CDIO engineering education model is put forward. EIP pays great attention to the cultivation of students' morality, honesty and professionalism. Generally speaking, EIP-CDIO is an organic combination of students' professional ethics and engineering practice ability. It aims at training senior engineering talents. The nature of engineering practice in the course of analog circuit has a very high, in the process of teaching practice, teaching by the way of the combination of life and work, reflected by a process of doing things, to ensure the smooth progress of work. Thus, in the process of training, we should pay attention to the edification of humanistic spirit, so that the trained college students have excellent professional quality and have a sense of responsibility.

### Introduction

The traditional, passive, spoon fed approach is no longer appropriate for Contemporary College education. In the application oriented university education, we must change from passive to active and adopt efficient engineering education mode. The EIP-CDIO engineering education model not only pays attention to the student's independent innovation and the engineering practice ability, but also pays great attention to the student's professional ethics and the professional quality. EIP means morality, honesty and professionalism. CDIO refers to the concept, design, implementation and operation, including product development, product implementation, the whole life cycle, and training students to learn in an active, practical and organic way between courses. EIP-CDIO pays attention to the organic combination of professional quality and conception design, implementation and operation. This kind of higher engineering education mode aims at training senior engineering talents. The aim is to enable students to have the ability to: project development, design and construction of strong; strong innovation ability; strong teamwork and leadership skills; strong communication skills; strong language expression ability. A person only has great initiative to learn to concentrate, clear direction, intent on, have an insatiable desire to learn, so as to edify sentiment, genuine knowledge. The initiative of learning comes from curiosity about the unknown, from the desire for new knowledge and skills, and from the sober understanding of one's own development and mission.

In this paper, the project can design and manufacture of a product, remove a fault, provide a service, designing a service project and other large projects, can also be a parts processing, validation of a theory, a case of small projects, its purpose is to promote the development of students' occupation quality. The combination of EIP-CDIO engineering education mode and the

course of analog circuits, the real education method engineering education model used in analog circuits in the course of analog circuit to promote the teaching effect of this course, the analog circuit in the course of enterprise and often used in the case of items together, make the students hands-on, unity cooperation, direct contact with the design case of the enterprise, in line with the times, learning new knowledge, to complete the project case teaching. There are many teaching cases in analog circuit, such as measuring the voltage amplification, the input and output resistance, and observing the output signal waveform with oscilloscope. In this process, not only can increase the knowledge of students, promote students' learning efficiency, enhance team spirit, to integrate with the enterprise and society, improve the occupation quality, ensure that the students can better integrate into society.

### **Work and Implementation Plan**

The original project driven teaching method mainly used the independent operation organization, but did not pay much attention to team work ability. With the development of modern science and technology and production organization, the occupation education have become increasingly demanding, more and more people use the way of team cooperation, joint planning and joint or division of labor to complete the entire project. Sometimes, to participate in the project driven teaching team of students from different majors, such as electronic professional and professional accounting, the purpose is to train the students in the future work in different areas, and different professional cooperation ability. In the electronic field, all products are almost as projects, such as chip, switch, alarm, counters, measuring instruments and simple wiring operation are the most common project; in the accounting profession, all has the overall characteristics and results of visible work can also be used for the project, such as financial arrangement data, merger, product budget. The project driven teaching method of this thesis is mainly aimed at the digital circuit course of electronic specialty.

Project implementation, there are four points need attention.

(1) The teacher needs to refine and guide the project before it is implemented

Before the start of the project, the teacher should explain and guide appropriately according to the degree of difficulty and the degree of mastery of the students.

In the mode of engineering education, teachers mainly explain the key points of the project, and let the students complete the project independently. For error prone in the project confusing part by the students themselves find and solve problems in the process of doing the project, so as to improve the skills. This is different from the traditional teaching methods, in traditional teaching, the teacher's explanation for the main part, teachers should not only focus on the content of many times, but also for the presentation of the project implementation steps of students, their practical experience to the students, this approach is not conducive to improve students' ability of independent thinking and problem solving. Therefore, problems often arise in the project should be found in the process of students in the project, and through their own efforts to find a solution. In a word, when a teacher is conducting a new project, he needs to explain the key points. For example, in analog circuits to measure signal waveform, the teacher focuses on the use of oscilloscope methods, specifically in this project, how to measure the use of the need for students to learn.

(2) Teachers should be grouped according to specific circumstances

The grouping and integration of the project takes into account the specific circumstances of the student and the degree of difficulty of the project. For relatively simple, involving a single new project, more suitable for students to complete independently; for a wide range of more difficult projects, the need to group cooperation to complete. In the process of cooperation, students can benefit by mutual discussion, each one airs his own views, help each other to solve more problems. According to the direction of the course, we should flexibly determine whether the students will work independently or in groups to complete the project.

(3) When the students implement the project, the teacher should give the students just the right direction

In the process of the implementation of the project, teachers should give different guidance to

students of different levels. Only when teachers grasp this yardstick can they help students find knowledge and improve their skills. In this way, the side and prompt guidance can help students to remember deeply, train students' divergent thinking and improve their creative ability.

(4) After the completion of the project, the teacher should make a proper evaluation summary

Because there are many students, the ideas and methods of the project are different. Some methods are simple, and some methods are complex. The final assessment of teachers can help students understand more refined solutions, so that students can master more skills, find their own shortcomings and strengths, and more conducive to improving students' innovative ability.

### **Implementation Principle**

In the process of implementation, the engineering education model needs to comply with certain principles.

(1) Engineering education model is a relatively complete process

Engineering education model requires students to complete a relatively complete working process in the implementation process. The work process is as follows: clear the project task, collect relevant information, working out the plan, deciding the implementation plan, organization the implementation of the project. This is a relatively complete process, students can organize their own, arrange their own learning, can also be completed with the students. In the course of work, students try to solve and deal with the difficulties they have encountered. After the completion of the project, students should conduct process checks, conduct project engineering evaluations, check yourself, find new problems, find solutions, and learn new knowledge and skills from them.

(2) The engineering education model should pay great attention to the students' learning process

The engineering education model pays more attention to the students' hands-on ability, but not the final result. In the process, students can exercise their professional skills. Teachers regard students as the dominant position of the project, the role of teachers is the guide and supervisor, improve students' interest in learning, to enable students to experience the joy of work and not easily, to improve the students' ability to solve problems.

(3) The project education model calls for the project as the main line

In the process of engineering education, teachers first select the appropriate project and determine the teaching content after the project is determined. Students can break down the project and decide whether to group the project according to the size and difficulty of the project. Each student shares his discovery when he completes his sub project.

(4) The teacher evaluates the students according to their completion

The engineering education model changed the former evaluation standards, and the students completed the project as the basis for evaluation. There are three levels for assessment: evaluation of the overall situation of the group; internal evaluation of the team based on the contribution of members; students' self-assessment. According to these three levels of assessment, Teachers giving the final academic performance.

### **Example Analysis of Project Driven Teaching Method Implementation**

Item name: triode and its single stage common emitter amplifier circuit.

Teaching objective: measuring and adjusting the quiescent working point of common emitter amplifier circuit.

Experimental equipment: digital oscilloscope, digital function generator, digital AC voltmeter, ohmmeter, electronic integrated experimental device, single tube amplifier experimental board.

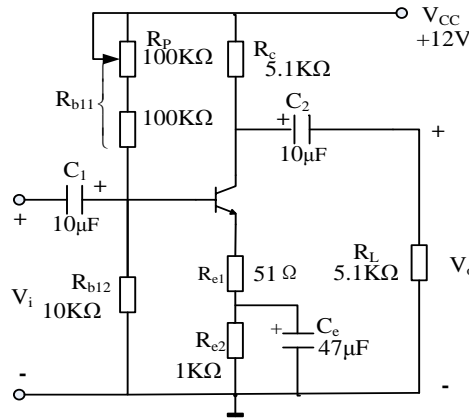


Figure 1. Single stage common emitter amplifier

The experimental reference circuit is shown in fig.1.

Engineering principle: A split voltage common firing amplifier with stable working point, which has the function of current amplification and voltage amplification. The circuit signal is input from the base and the collector outputs. The input resistance is equal to the forward bias resistance of the diode with the same material, the output resistance is higher, and the output voltage is reversed to the input voltage, so it is used for amplification of small signals or for intermediate stages of multi-stage amplification circuits.

Project content: measure the static working point of the circuit in the linear amplification state.

As shown in Fig. 1, before the DC power source is connected, the Rp is first shifted to the maximum, and the function signal generator output knob is turned to zero. Switch on the +12V power supply, adjust the Rp, and make  $I_c = 2 \text{ mA}$  (i.e.  $U_E = 2 \text{ V}$ ). Measure  $U_B$ ,  $U_E$ ,  $U_c$  with ohmmeter DC voltage meter, and measure Rb11 value with ohmmeter, omega file, and record in table 1.

Table 1 Measurement and calculation of quiescent working point

Measured value				Calculated value				
$U_B$ (V)	$U_E$ (V)	$U_c$ (V)	Rb11 (k $\Omega$ )	$U_{BE}$ (V)	$U_{CE}$ (V)	$I_c$ (mA)	$I_B$ ( $\mu$ A)	$\beta$
2.65V	2V	7.57V	60.1	0.65	5.57	1.85mA	0.03mA	61.7

When the project is implemented, we should pay attention to the following points: First of all, teachers should do fine instruction for students before the project is implemented; Second, depending on the size and ease of the project, decide whether to do it alone or in groups; Thirdly, during the implementation of the project, the teacher should carry out the right direction according to the students' level; Finally, after the completion of the project, the teacher will make a necessary assessment of the project completion of the students.

### Summary

Engineering education mode and the traditional mode of education, it is a relatively complete work process, pay more attention to the work process of students, and students are expected to find problems in the process of the project, to find a solution and finally solve the problem. The teacher is no longer the protagonist of the classroom, the students are placed in the core position, EIP and CDIO in the course of the real combination, focusing on training students hands-on practical ability and professional ethics.

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