

# *Reform and Practice of Software Engineering Talents Training Program in Application-Oriented Universities Based on Asiin Certification*

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**Abstract:** ASIIN is a non-profit organization established by universities, Universities of Applied Sciences, authoritative science and technology associations, professional education and further education associations and important industrial and commercial organizations under the initiative of German Engineers Association. Guided and promoted by the advanced concept of ASIIN certification, it is a systematic project for the school to certify the majors of traditional Chinese applied undergraduate colleges through ASIIN institutions according to the interdisciplinary characteristics of the majors in the process of cultivating applied talents. This paper introduces the significance of ASIIN certification, and summarizes the reform and practical thinking of software engineering talents training program in application-oriented universities. On the basis of setting professional goals and exploring and improving learning achievements, this paper puts forward the reform requirements and guiding ideology of revising professional course syllabus. The educational reform based on ASIIN certification can promote the cultivation of network engineering talents who adapt to engineering, nationalization and modernization in China.

## 1. Introduction

Educational thoughts and concepts directly affect the improvement of talent training quality and the innovation of talent training mode, and educational philosophy actually guides teachers' educational behavior [1-2]. Software industry is the core of information industry, and software talents are the core elements of the development of software industry, so the training of software talents is of great significance. This major trains students with good comprehensive quality and professional ethics, basic theories, professional knowledge and basic skills of computer science, master software development methods, and have the ability of systematic analysis, design, development and testing of software projects.

ASIIN is the only certification institution in Germany for education projects and master's education projects in engineering, information science and other disciplines [3]. In recent years, the rapid development of science and technology requires a new orientation of software engineering specialty, and many educational institutions have begun to reform and practice the curriculum outline of software engineering specialty under ASIIN certification, so as to better adapt to the development of society and the requirements of the country [4-5]. Aiming at the evaluation system

of ASIIN evaluation institutions in Germany, this paper discusses the reform and practical thinking of software engineering talents training program in application-oriented universities.

## 2. Asiin Certification Significance

ASIIN is a non-profit organization established by universities, Universities of Applied Sciences, authoritative science and technology associations, professional education and further education associations and important industrial and commercial organizations under the initiative of German Engineers Association. In order to ensure the quality of newly established bachelor's and master's majors, the German Conference of Ministers of Culture and Education decided not to follow the traditional input management method, but to require a neutral certification body to make compulsory evaluation and certification of newly established degrees and majors to ensure the quality of new degrees and their courses.

In ASIIN's view, talent training in application-oriented undergraduate colleges is usually divided into three stages: defining objectives, implementing process, checking results and subsequent development [6-7]. German higher education accreditation system has established a decentralized management and mutual restraint mechanism through the design of accreditation system, and at the same time, a new pattern of public governance of German higher education has been formed through the participation of multiple subjects through accreditation committees and evaluation teams (see Figure 1 on the next page for details).

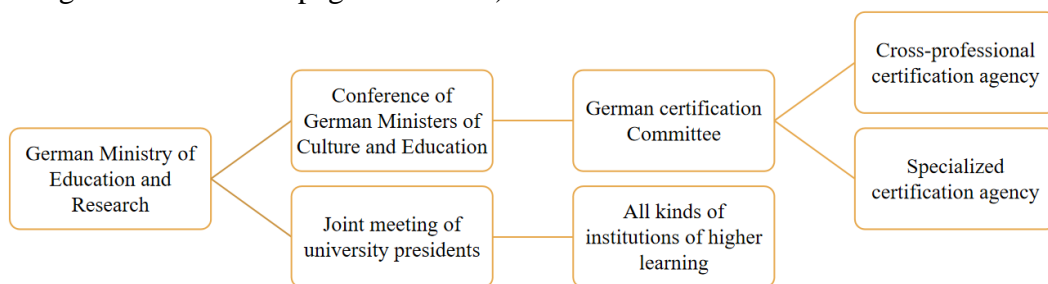


Figure 1: Organizational Structure of Higher Education Certification System in Germany

ASIIN certification has a high evaluation in Germany. The urgent task of China's higher network engineering education is to cultivate all-round new talents as soon as possible, even software engineering professionals who can directly connect with international work. Graduates from certified schools can work as engineers in Europe, America and other countries after obtaining their degrees [8-9]. ASIIN certification not only proves the authority of the school's software engineering specialty, but also lays a good foundation for the development of network engineering students after graduation, and realizes the desire of cultivating international professionals in China.

Guided and promoted by the advanced concept of ASIIN certification, it is a systematic project for the school to certify the specialties of traditional Chinese application-oriented undergraduate colleges through ASIIN institutions according to the characteristics of interdisciplinary specialties in the process of cultivating applied talents [10-11]. The process of ASIIN certification for traditional undergraduate students in China involves many aspects such as professional orientation, training scheme, curriculum outline, training mode and training system. To cultivate students' engineering practice ability as the core, and at the same time cultivate students' lifelong learning ability and social adaptability.

### **3. Reform Background of Talent Training Scheme for Software Engineering Specialty**

#### **3.1 Target Positioning is Not Accurate**

According to the development of software industry and facing the needs of enterprises, we should take the road of school-enterprise cooperation and explore a new mode of training applied software talents. At present, the number of software talents in China is not only insufficient, but also the structure is unbalanced, which is manifested in the lack of practical ability of software development professional posts, which leads to that the talents recruited by software enterprises from application-oriented undergraduate colleges must undergo several months of professional post training before they can really be competent for the job [12].

Attaching importance to the theoretical knowledge of disciplines while neglecting the training of project practice ability is inconsistent with the positioning of application-oriented undergraduate colleges, unable to really train practical talents, and unable to keep pace with the rapid development of software industry, so the inherent talent training mode cannot meet the rapid growth demand of software industry.

#### **3.2 The Teaching Content Lacks Practicality**

Software industry is one of the most promising emerging industries in the 21st century, and now it has developed into the core of national information industry and the foundation of national economic informatization. It aims to cultivate a large number of high-quality engineering and technical talents with strong innovation ability and meet the needs of economic and social development, to serve the country's strategy of taking a new road of industrialization development, building an innovative country and strengthening the country with talents, to promote higher education to train talents for social needs, and to comprehensively improve the training quality of engineering education talents.

China's software engineering major started late, the education and teaching methods are still in the exploratory stage, the applied curriculum system is not perfect, and the current theoretical curriculum arrangement is still far more than practical courses. The content that can be used in practice is also monotonous. Teachers do not guide students to extend their basic knowledge, and students' understanding of knowledge is only at the primary stage, and the degree of mastery is far from enough. The separation of theory from practice makes it difficult to train software engineering professionals.

#### **3.3 Weak Teachers**

At present, most teachers in application-oriented undergraduate colleges are “from school to school”, lacking experience in actual project development. In addition, the school is not closely connected with the industry and enterprises, so it is difficult for teachers to understand and master the latest technological development and system of enterprises in time, resulting in obvious lack of professional practice ability.

The construction of double-qualified teachers is the bottleneck and key of professional construction. In recent years, the college has successively recruited more than ten teachers with working experience in the software industry, constantly expanding the proportion of double-qualified teachers in the whole college; And through the effective mechanism of sending teachers to practice in software enterprises, the construction of double-qualified teachers is guaranteed to take a sustainable development road.

## 4. Reform and Practice of Software Engineering Talents Training Scheme under Asiin Certification

### 4.1 Improve the Professional Curriculum System

In the process of training software talents, the curriculum system is an important link to realize the training goal, and it plays a decisive role in students' knowledge structure and ability structure. Students can practice through real and concrete projects. Understand the employment requirements of enterprises, improve the mastery and understanding of skills points, and pay attention to the cultivation of project experience to meet the basic needs of enterprise development and create favorable conditions for employment. The curriculum system is shown in Figure 2.

General Education	Professional basic courses	Professional compulsory course	Professional Elective Courses	Practical teaching
<ul style="list-style-type: none"> <li>• humanity</li> <li>• society</li> <li>• natural</li> <li>• Art</li> <li>• Sports</li> <li>• English</li> </ul>	<ul style="list-style-type: none"> <li>• Mathematics course</li> <li>• Fundamentals of Program Design</li> <li>• data structure</li> <li>• operating system</li> <li>• Principles of computer composition</li> <li>• database system</li> </ul>	<ul style="list-style-type: none"> <li>• Software engineering economics</li> <li>• Software system analysis and design</li> <li>• software architecture</li> <li>• software project management</li> <li>• Software testing and maintenance</li> <li>• Specialty English</li> <li>• Unified modeling language UML</li> </ul>	<ul style="list-style-type: none"> <li>• Digital Media Art</li> <li>Embedded direction</li> <li>Smart space direction</li> <li>Mobile terminal direction</li> <li>Network information security direction</li> </ul>	<ul style="list-style-type: none"> <li>• social practice</li> <li>• Professional Practice of Software Engineering</li> <li>• Graduation Design</li> <li>• Graduation Practice</li> </ul>

Figure 2: Curriculum System

Teaching plan and curriculum outline are normative and guiding documents for running a professional school, and are the basic basis for running a school. According to ASIIN's requirements, majors must have clear and definite major setting objectives, but unlike the macro-literal description of China University's training objectives, the major setting objectives must be specific and definite, and there must be concrete learning results.

The contents stipulated in the curriculum outline include: module name, level, code sub-module, course name, start time, course director, instructor, the position and role of this course in the training program, teaching form and teaching hours, students' learning burden, credits, and preparation before the exam. According to the overall development strategic plan and construction goal of the school, the software engineering specialty formulates its professional construction and development plan, and establishes the professional development and talent training mode based on engineering education certification.

In the course of the reform and practice of the software engineering curriculum under ASIIN certification, we need to fully consider the current actual situation in China and the current education model in China. Through the study of related courses, we can broaden students' professional knowledge, cultivate students' engineering control problems in using computers and modernism, and better cultivate students' comprehensive engineering ability. Students can systematically master the basic knowledge and theory of network engineering and computer knowledge. Have the design, analysis and engineering practice ability of network control system, and cultivate engineering methods that can use advanced tools and means to solve related problems.

## 4.2 Implement School-Enterprise Cooperation

School-enterprise cooperation is the cooperation between schools and enterprises in resources, technology, teacher training, on-the-job training, students' employment, scientific research activities, etc. It is an educational model for the purpose of cultivating applied talents that can adapt to the development of market economy and the needs of enterprises by using different educational resources and educational environment between schools and enterprises. In the whole course teaching, enterprises undertake about one-third of the teaching tasks with strong engineering practice: through school-enterprise cooperation, professional ethics education and professional quality education are integrated into the course teaching. Through school-enterprise cooperation, students can go to the enterprise for on-site internship during their school days, get familiar with software development methods and related processes, accumulate engineering practical experience, cultivate innovative ability, and adapt to the post requirements of software enterprises as soon as possible after graduation.

The mode of jointly training software design engineers between schools and enterprises is to complete the work training and skills training of enterprises in advance to the university stage, which can not only strengthen the cultivation of students' practical ability, improve their social adaptability, but also shorten the adaptation period of new employees to enterprises. According to the concept of engineering education, Universities of Applied Sciences's curriculum system should adapt to the new generation of information technology, software design engineering, intelligent production and technical practice needs of the front line of construction, pay attention to cultivating students' professional skills and comprehensive quality, integrate and innovate the latest technologies, manufacturing processes and design methods in their professional fields, and pay attention to the cultivation of students' innovative consciousness and ability.

## 4.3 Develop a New Type of Double-Qualified Team

ASIIN certification not only makes clear requirements for educational goals, but also invisibly puts forward higher requirements for teachers. Actively carry out network engineering teaching and research work according to ASIIN certification, participate in the research and development of corresponding engineering projects, regularly participate in exchange activities, absorb the successful experience of others, constantly enrich their knowledge reserves, and ensure the times and advancement of network engineering teachers.

Under ASIIN certification, teachers are no longer simple knowledge providers, but knowledge leaders and practitioners. In order to train high-quality software design engineers, we must build a team of teachers with high-level engineering practice ability and double-qualified quality. Through short-term exercise, teachers can keep abreast of the latest research status and development trend of their major, and at the same time concentrate on solving the problems found in the teaching process and improve their professional level. Long-term practical exercise is a training mode to realize the joint running of schools and enterprises.

Strengthening the construction of teaching staff is the breakthrough of the current reform and development of higher education. To cultivate engineering applied talents, it is necessary to build high-level engineering education teachers. On the one hand, in order to improve the engineering application ability of on-the-job teachers, the college organizes young teachers to study in national model software colleges in a planned way every year to improve their practical ability. On the other hand, the college has formulated the selection method of part-time teachers in enterprises, widely hired enterprise teachers and established a part-time teacher library. After several years of construction, a team of engineering education teachers with full-time and reasonable structure has been gradually formed.



## 4.4 The Reform of Curriculum Evaluation Mechanism

The examination of software engineering course cannot simply use the form of closed book plus theoretical examination, so it is necessary to explore an examination method that conforms to the characteristics of this major. We adopted various forms, such as closed-book examination, open-book examination, computer report and project design. The reform of course evaluation mechanism focuses on process evaluation, mainly because the importance of theoretical knowledge examination is relatively weak for professional courses aimed at cultivating students' practical operation ability. In the process of studying professional courses, students' strong practical ability and high professional quality, as well as the quality of course design and project case homework, can better reflect our goal of cultivating applied talents.

## 5. Conclusion

Software industry is the core of information industry, and software talents are the core elements of the development of software industry, so the training of software talents is of great significance. In recent years, the rapid development of science and technology requires a new orientation of software engineering specialty, and many educational institutions have begun to reform and practice the curriculum outline of software engineering specialty under ASIIN certification, so as to better adapt to the development of society and the requirements of the country. On the basis of analyzing the evaluation standard of ASIIN, according to the characteristics of software engineering specialty, the corresponding goals and clear learning results are set, and the corresponding revised outline requirements and guiding ideology are put forward. The reformulated teaching mode meets the standard requirements of ASIIN evaluation, which is of great significance for training international engineering talents.

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