Discussion on the Path of Emergent Engineering Construction in the Course System of Mechanical Manufacturing

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Abstract: The construction of emergent engineering is an urgent need for the development of new economy. The traditional curriculum system of mechanical manufacturing can not meet the requirements of emergent engineering. Orient to the needs of the industry, this paper explores the cross integration of artificial intelligence, big data, robots and mechanical manufacturing courses, constructs a professional course system for emergent engineering and realizes the transformation and upgrading of traditional mechanical manufacturing specialty.

1. Introduction

With the development of a new round of industrial revolution, enterprise technology develops rapidly, which puts forward new requirements for engineering education. In order to face the industry and cultivate technical talents to meet the needs of enterprise technology upgrading, it is necessary to carry out the curriculum system reform of relevant majors and realize the upgrading and transformation of traditional majors. As an important pillar of national economy, machinery manufacturing industry is facing many new changes. With the rise of artificial intelligence, big data, cloud computing, virtual reality and other technologies, the mechanical manufacturing industry must be deeply integrated with new technologies to meet the requirements of new economic development. Therefore, this paper focuses on the construction of innovative curriculum system for emergent engineering and discusses the construction path of new engineering for mechanical manufacturing specialty.

2. Analysis of Industry Demand

The demand for talents in manufacturing industry has also changed greatly with the development of new economy. In recent years, in machinery manufacturing enterprises, the number of low and medium skilled jobs has been gradually reduced, and many intelligent manufacturing engineer positions have been increased, such as electromechanical integration experts, robot coordinators, industrial data analysts, etc. From the perspective of employee team, the outstanding problems faced by these enterprises include more junior technicians, less senior technical personnel; more traditional technicians, less modern technical personnel; more single skilled technical personnel and less composite technical personnel. The low comprehensive quality of employees directly restricts the development of enterprises.

At present, the development of artificial intelligence, big data, cloud computing, virtual reality and other technologies is changing with each passing day. It has become a consensus to integrate these new technologies with mechanical courses and upgrade traditional mechanical manufacturing to intelligent manufacturing. On the other hand, due to the late start of industrialization, the relatively weak technology accumulation and the relatively low level of informatization in China, the intelligent upgrading of China's manufacturing industry is facing severe challenges. First, the overall level of integration of industrialization and informatization to be further improved. The development of informatization among regions, industries and enterprises in China is not balanced. Some enterprises have begun to explore intellectualization, but more enterprises are still in the stage of electrification, automation and even mechanization. Semi mechanization and manual production still exist in some underdeveloped areas. Second, the basic research ability of intelligent

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manufacturing is relatively weak. There is still a big gap between China's domestic, academic and research level and the advanced countries. The lack of independent research and development technology of intelligent software and hardware, high-end sensors, operating systems and key components mainly rely on imports, hindering the development of intelligent manufacturing to a certain extent. Third, intelligent manufacturing mode is still in its infancy. China's enterprises have long relied on low labor costs to form cost depressions, which are used to compete in the international and domestic markets, resulting in low-end lock-in of the global value chain. Most enterprises lack the power to use intelligent equipment instead of artificial labor. Fourth, the foundation of intelligent manufacturing standards, industrial software and network information security is weak. It can be seen that with the industrial upgrading and equipment upgrading, manufacturing industry has an urgent need for high-quality talents with knowledge and skills related to intelligent manufacturing.

3. Curriculums Setting

According to the requirements of the machinery industry for the cultivation of intelligent manufacturing talents, the goal of the cultivation of intelligent manufacturing talents is to cultivate the composite engineering talents with the interdisciplinary knowledge of mechanical engineering, control science and engineering, computer and information management technology. Through theoretical and practical courses, students receive basic training in intelligent manufacturing engineering technology from theory to practice, including intelligent product design and manufacturing, intelligent equipment fault diagnosis, maintenance and repair, intelligent plant system operation, management and system integration. Facing the related fields of intelligent manufacturing, the graduates can be engaged in product digital design, industrial robot system integration, high-end numerical control processing and programming, intelligent operation and management of production line system, operation and sales, intelligent equipment control and maintenance, and technical services, etc. in the company or scientific research institute, so as to cultivate students with broad professional knowledge, solid engineering foundation and outstanding practical ability Strong ability to study for life. After graduation, students can use advanced information technology to solve complex engineering problems in the field of intelligent manufacturing, as shown in Figure 1.

Figure 1 Requirements of Intelligent Manufacturing

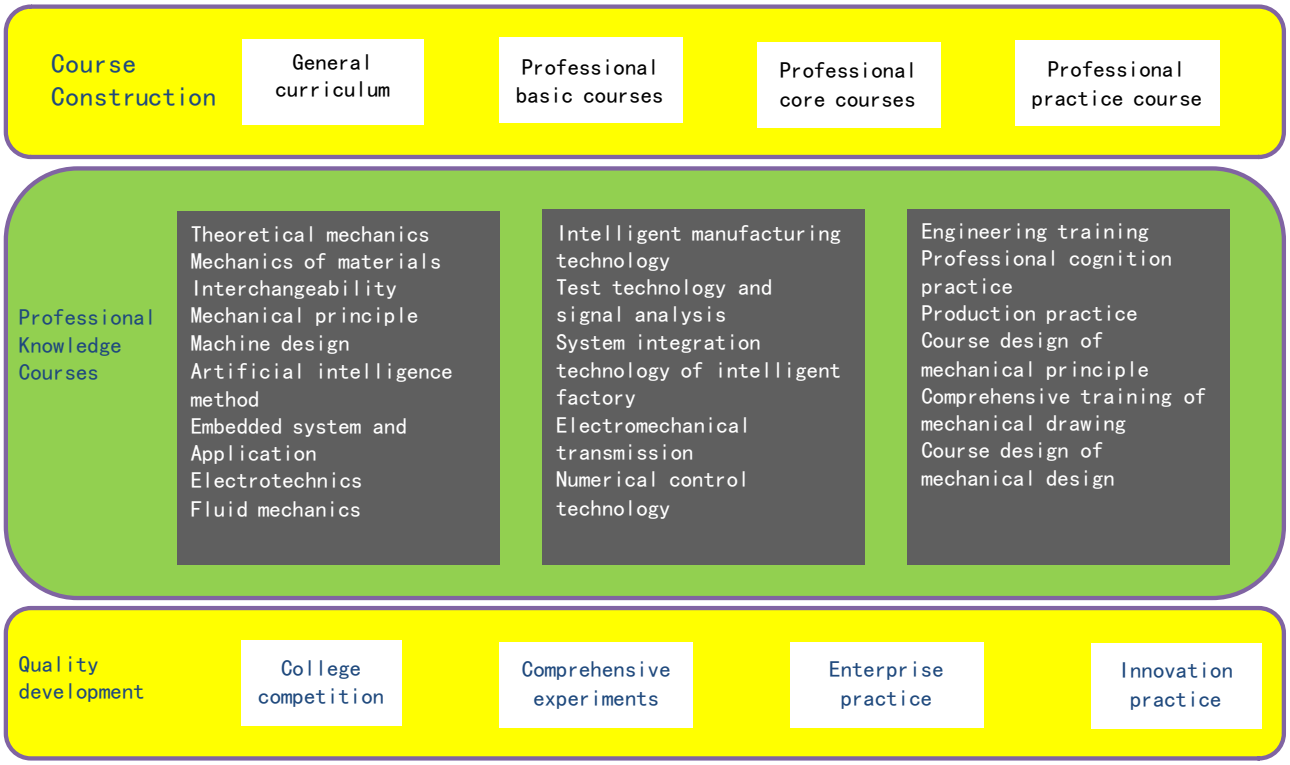

Figure 2 Curriculums System

Starting from the training objective of intelligent manufacturing talents, this paper constructs an innovative curriculum system for new majors. The overall idea is to emphasize basic courses, strengthen main courses and highlight innovative courses. By increasing a number of comprehensive and cross professional courses, the curriculum system structure is optimized, and the quality of education and teaching is comprehensively improved. The innovative curriculum system for new majors mainly includes four aspects: General Education, professional foundation, professional core, professional practice. At the same time, according to the inherent law of the curriculum, the professional knowledge curriculum is constructed into three modules: theoretical basis, professional basis and professional practice. According to the characteristics of these three modules, the digital teaching platform and online course platform are constructed. With the intelligent manufacturing experimental center as the carrier, the digital teaching practice base of intelligent manufacturing is established, and the open experimental teaching is implemented. The whole curriculum system is shown in Figure 2. According to the requirements of engineering teaching hours, the total credits are 195 credits, including 48 credits for general education, 79 credits for professional basic courses, 21.5 credits for professional courses and 46.5 credits for practical teaching links, as shown in Table 1. The proportion of practical teaching credits is 31.4%, which guarantees the development of students' innovative activities.

Table 1 Curriculums Setting

Course category	Nature of reading	Classification instructions	Credits	Proportion (%)
General curriculum	Obligatory	Public Course	41	22.2%
	Elective	Public elective course	7	3.8%
Professional basic courses	Obligatory	Basic course	73	39.5%
	Elective	Extended Curriculum	6	3.2%
Professional core	Obligatory	Machine manufacturing	17.5	9.5%

courses	Elective	Machine manufacturing		4	2.1%
Practice courses	Obligatory	Machine manufacturing		36.5	19.7%
		The second classroom		10	
Min Credits	195	Obligatory	90.8%	Practice	31.2%
		Elective	9.2%		

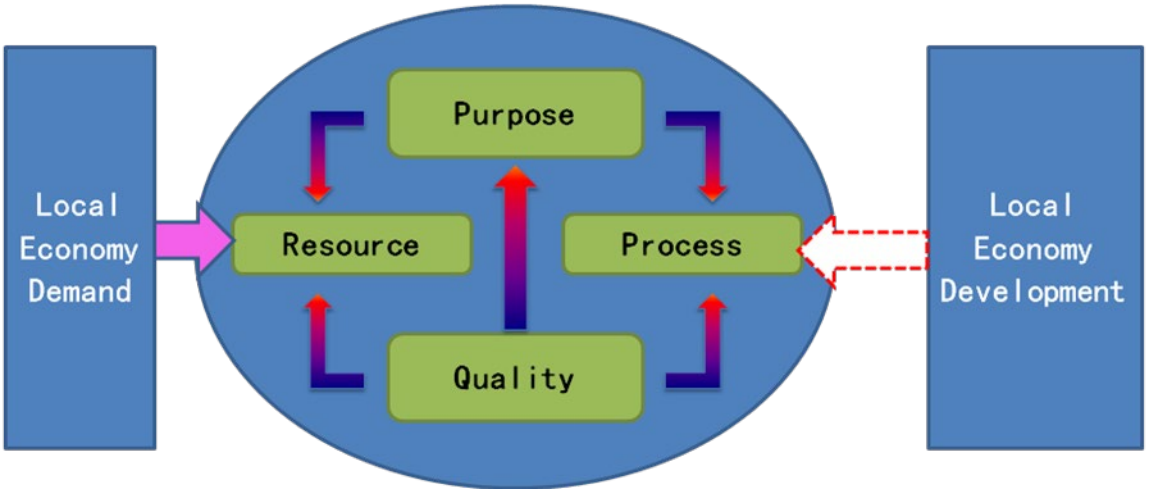

Figure 3 Teaching Quality Monitoring System

The perfect teaching quality monitoring system is the beneficial guarantee of the curriculum implementation. According to the requirements of local industry and regional economic development, through the management of teaching quality objectives, teaching resource management, teaching process management and teaching quality monitoring, to achieve the integration of management and control of the course teaching process, as shown in Figure 3. The teaching effect is measured by the development of students and fed back to the teaching quality monitoring system. The satisfaction of students and enterprises is the only evaluation standard of curriculum teaching system. Therefore, the curriculum system of new engineering is closely related to the needs of enterprises for talents, so as to avoid the disconnection between the knowledge and skills learned by students and the needs of enterprises.

4. Conclusion

The construction of emergent engineering is a systematic project. Focusing on the industrial chain and innovation chain, this paper starts from the construction of the curriculum system of the mechanical manufacturing specialty, combined with the needs of the regional economy, realizes the cross integration of multi-disciplinary knowledge and the mechanical manufacturing curriculum through the systematic curriculum system design and curriculum setting. The purpose is transformation and upgrading of traditional machinery manufacturing through the reasonable credit distribution, the curriculum module setting, and the cultivation of students' practical ability and the professional quality of the application ability.

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