

Research and Practical Exploration on the Reform of Robotics Engineering Curriculum System Empowered by Petroleum Industry Features

Lei Zhang^{1,2,*}, Meiqiu Li^{1,2}, Tiancheng Huang¹, Anding Li¹, Chao Wang¹, Yun Zeng¹

¹*School of Mechanical Engineering, Yangtze University, Jingzhou, Hubei, China*

²*State Key Laboratory of Low Carbon Catalysis and Carbon Dioxide Utilization, Wuhan, Hubei, China*

**Corresponding Author*

Abstract: With the deepening advancement of the “Double World-class Project” and Emerging Engineering Education, traditional engineering majors are facing unprecedented reform opportunities and challenges. As an emerging interdisciplinary discipline, robotic engineering faces a critical question for industry-featured universities: how to achieve differentiated development by leveraging industrial characteristics. As a local university with a distinct petroleum industry background, Yangtze University should base the construction of its Robotic Engineering major on serving the national energy security strategy and the demand for the transformation and upgrading of the regional petroleum and petrochemical industry, and explore a new talent cultivation path featuring “empowering robotic engineering with petroleum characteristics”. Taking the robotic engineering major of Yangtze University as the research object, this paper targets the urgent demand for robotics professionals driven by the intelligent transformation of the petroleum industry. It analyzes existing deficiencies of the current curriculum system in integrating petroleum industry characteristics, adapting teaching contents and supporting practical training platforms. Furthermore, this study puts forward the guiding principles for curriculum system reform oriented by empowerment via petroleum industry features, and systematically elaborates the reform and construction approaches from four dimensions: reconstruction of curriculum modules, optimization of teaching contents, upgrading of practical training platforms, and collaborative talent cultivation through industry-education integration. It bears important theoretical

value and practical significance for cultivating high-quality application-oriented talents that meet the demands of the petroleum industry, and relevant explorations can provide references for the construction of Robotic Engineering majors in industry-featured universities.

Keywords: Petroleum Empowerment; Emerging Engineering Education; Robotic Engineering; Curriculum System; Teaching Reform

1. Introduction

As a vital fuel and chemical raw material, petroleum is confronted with mounting energy consumption, elevated operational risks, worsening environmental pollution and other challenges amid the continuous increase in exploitation depth. Benefiting from high efficiency and intelligence, robotics technology [1,2] can help the petroleum industry boost core competitiveness and achieve sustainable development goals. Accordingly, it is urgent to cultivate specialized robotics talents tailored to the petroleum sector.

Since 2017, the Ministry of Education has issued a series of documents on the development of Emerging Engineering Education, including the Notice on Launching Research and Practice of Emerging Engineering Education and the Circular of the General Office of the Ministry of Education on Announcing the First Batch of Research and Practice Projects for Emerging Engineering Education [3-5]. These documents set the development goals, formulate implementation roadmaps, and clarify core construction contents for Emerging Engineering Education. Universities are required to proactively align with major national strategic demands and

industrial development trends, restructure talent training systems, curriculum systems and practical training systems, and cultivate interdisciplinary and innovative engineering professionals capable of tackling complex engineering problems. This provides clear policy support and development orientation for the establishment of the Robotic Engineering major.

Robotic Engineering is reformed and extended from traditional engineering disciplines including Mechanical Design, Manufacturing and Automation, Electrical Engineering and Automation, as well as Control Science and Engineering. It features timely restructuring of disciplinary frameworks and content, together with integrated expansion toward emerging technology industries. The construction of the curriculum system for a new major is fundamental to its ability to meet current social development and industry demands. In particular, cultivating specialized talents for characteristic industries serves as a driving force for sound development of Emerging Engineering Education majors. Oriented toward the research and application of robots for the petroleum industry, the major caters to the demands of petroleum and petrochemical sectors as well as local equipment manufacturing enterprises. It aims to cultivate high-quality application-oriented talents equipped with basic theories and professional knowledge for engaging in design, manufacturing, technological development, scientific research, production organization and management in fields related to robotic engineering, who are endowed with innovative awareness and practical capabilities.

Yangtze University boasts profound experience in running programs rooted in the petroleum and petrochemical industry, with sound disciplinary foundations in petroleum engineering, geological resources, mechanical equipment, electrical automation and other fields. As the oil and gas industry shifts toward digitalization and intelligence, new application demands for robotics technologies have emerged in multiple scenarios, including oil and gas field production and operation maintenance, well site inspection, pipeline testing, offshore oil and gas equipment maintenance, and replacement operations in hazardous environments. This also creates a distinctive niche for the development of the

Robotic Engineering major. Therefore, relying on the university's petroleum industry background, integrating petroleum characteristics into the training objectives, curriculum system, teaching contents and experimental practice platforms of the Robotic Engineering major, and exploring a reform path of "empowering major construction with industrial characteristics" is not only a practical requirement for improving talent training quality, but also a vital measure to forge differentiated competitive advantages for the major.

On this basis, taking the Robotic Engineering major of Yangtze University as the research subject, this paper addresses the challenges confronting the petroleum industry and complies with the requirements of Emerging Engineering Education. It carries out research and practical exploration on the curriculum system reform for undergraduate Robotic Engineering majors from the dimensions of curriculum framework, teaching content, experimental training and practical practice, so as to offer references for the construction of Emerging Engineering Education in similar industry-featured universities [6,7]. The training objective of "machinery as the foundation, control as the core, and petroleum as the distinctive feature" coincides perfectly with the prevailing philosophy of Emerging Engineering Education construction. Conducting research and practical exploration on curriculum system reform for Robotic Engineering with petroleum industry characteristics is of great significance for improving the capability of talent training in this major to rapidly match post requirements in the petroleum industry.

2. Industry Demands

2.1 New Demands from National Energy Strategy and Intelligent Transformation of Oil and Gas Industry

Energy security constitutes a vital component of national security. At present, China's oil and gas exploration and exploitation are gradually extending to deep formations, deep waters, unconventional reservoirs, complex strata and high-risk environments. The traditional production model relying on manual experience and intensive manual operations is confronted with multiple pressures concerning efficiency,

safety and costs. Meanwhile, the construction of intelligent oilfields, digital oil and gas fields, smart pipeline networks and unattended stations is steadily advancing, generating a growing industry demand for robotics technologies. In 2021, General Secretary emphasized during his inspection at Shengli Oilfield that “China’s energy supply must remain firmly in our own hands”, which elevates the petroleum industry to a strategic height and endows it with new implications for the new era. Faced with the production transformation across all links of the petroleum sector, General Secretary pointed out that we must fully apply the new development philosophy, balance development and security, and strive to take new strides in advancing the transformation and development of resource-based economies.

In petroleum field operations, from drilling and completion to oil production and gathering, the environmental conditions and operational execution behaviors encountered at each stage exhibit high complexity and significant variability, which necessitate that the professional training system possess both comprehensive breadth in its curriculum and vertical depth in the specialized knowledge it imparts. For instance, detection robots for petroleum exploration [8], internal inspection robots for long-distance transmission pipelines [9], inspection robots for well sites and stations [10], and explosion-proof operation robots for hazardous environments all bear distinct industry-scenario characteristics. Such applications require students to master general robotics theories and core technologies, as well as to understand petroleum technological processes, equipment structures, operating environments and safety codes. Therefore, the curriculum system of the Robotic Engineering major needs scientific development empowered by petroleum industry characteristics.

2.2 Interdisciplinary Talent Cultivation Driven by Petroleum Robot Application Scenarios

Robots deployed in the oil and gas industry are required to feature strong adaptability to complex environments, clear task orientation, tight cross-disciplinary coupling and stringent engineering standards. Accordingly, robotics professionals for the petroleum sector ought to possess comprehensive competencies: solid foundational knowledge of robotics, thorough

comprehension of petroleum engineering scenarios, sound engineering practical capabilities, and outstanding innovative thinking and interdisciplinary collaboration skills. This necessitates a shift of the specialized curriculum system from a general-technology orientation to an industry-scenario-driven and application-capability-oriented framework.

2.3 Distinctive Major Features Oriented by Regional Industry and Employment

Yangtze University serves Hubei Province and the Yangtze River Economic Belt, and maintains close ties with domestic petroleum and petrochemical enterprises such as Jiangnan Oilfield and Southwest Oil & Gas Field. Local and industrial enterprises demand graduates for positions covering robot research and development, automatic control, intelligent equipment operation and maintenance, industrial visual inspection, unmanned system application and more. A curriculum system devoid of petroleum characteristics tends to decouple talent cultivation from corporate industrial demands and weaken graduates’ competitiveness in the job market. In contrast, reinforcing industrial adaptability through petroleum-featured curriculum modules, practical projects and industry-university collaborative training mechanisms can effectively improve students’ employment matching degree and professional identity.

3. Current Situation Analysis

The Robotic Engineering major at Yangtze University was established in 2021 and ranks among the earliest Robotics Engineering majors offered by petroleum-focused institutions of higher education in China. Relying on the national first-class major of Mechanical Design, Manufacturing and Automation, the major is equipped with one provincial-ministerial platform and four university-level platforms, namely the Hubei Engineering Technology Research Center for Oil and Gas Drilling and Completion Tools, the Institute of Geothermal Resource Development, the University Student Robot Innovation Laboratory, the Comprehensive Robot Laboratory, and the Robot Vision Laboratory. This major successfully passed the undergraduate major inspection organized by Hubei provincial institutions of higher education in 2025.

The major has three pivotal milestones marking its development. In 2017, it began enrolling and training undergraduates as a robotics specialization under the Mechanical Design, Manufacturing and Automation major via a modular training model. In 2019, the major formally entered the preparation phase, when the curriculum system and talent training program were systematically designed, putting major construction on the fast track. In 2021, the major was approved by the Ministry of Education to officially recruit students, becoming one of the priority-developed Emerging Engineering Education majors at Yangtze University.

This major inherits the academic heritage of petroleum equipment disciplines and the major of Mechanical Design, Manufacturing and Automation. The petroleum and mechanical disciplines can be traced back to Beijing Petroleum Industrial College founded in 1950, and undergraduate enrollment was initiated by the Development Department of the former Jiangnan Petroleum Institute in 1978. Through nearly fifty years of systematic development of the mechanical engineering undergraduate major, automation and intelligent technologies applied to a wide range of oil and gas field drilling and production equipment as well as petroleum machinery have become the mechanical major's characteristic specialty direction, and the major now holds a leading status among domestic petroleum-focused institutions of higher education. The Petroleum Machinery major was recognized as a National Characteristic Major in 2010 and selected in the National Outstanding Engineer Education and Training Program in 2011. The profound accumulation of traditional disciplines and industrial background have laid a solid foundation for the construction of the Robotic Engineering major. In light of the requirements for Emerging Engineering Education development, three prominent problems exist in the curriculum design of this major:

(1) There is a lack of effective integration and cohesive design of knowledge layers between the petroleum industry background and the general robotics curriculum system. This major was gradually developed from the robotics modular specialization under Mechanical Design, Manufacturing and Automation, a discipline that has built remarkable strengths and distinctive features in petroleum field

machinery. As an interdisciplinary Emerging Engineering Education major, it covers mechanical engineering, computer science, control theory and control engineering, artificial intelligence, intelligent sensors, bionics and other disciplines. Restricted by its short development history, its curriculum is mainly formulated with reference to the university's mechanical major, with core courses dominated by traditional mechanical subjects such as Descriptive Geometry and Engineering Drawing, Engineering Mechanics and Fundamentals of Mechanical Design. The proportion of core robotics courses including Artificial Intelligence, Robotics and Principles of Automatic Control in the overall curriculum framework needs to be increased. Meanwhile, petroleum-specific knowledge has not been systematically integrated into the curriculum system, and a progressive three-in-one curriculum chain of "basic general robotics theories - petroleum industrial application scenarios - design and development of intelligent oil and gas equipment" has not yet been established.

Students lack understanding of harsh working conditions in all operational links of the petroleum industry (high temperature, corrosion, high pressure, flammability and explosion hazards, etc.) and mastery of industry-specific expertise. Consequently, they struggle to fully grasp special requirements in material selection, structural design and other aspects, making it difficult for them to design and develop robots applicable to petroleum scenarios. The in-depth industry-specific knowledge has not been integrated into theoretical teaching, and the empowering effect of industrial characteristics cannot be leveraged, which hinders the integration of robotics technology and the petroleum sector. Transforming typical petroleum industry application scenarios into curriculum cases and teaching modules to shift general robotics education toward training industry-featured application-oriented talents is the top priority to be addressed urgently in the current construction of the curriculum system.

(2) The updating of teaching contents lags behind technological progress, and cutting-edge knowledge and emerging technologies urgently need to be introduced to adapt to the rapid iteration of the robotics field. At present, general courses suffer from disconnection between theoretical knowledge taught and

practical cutting-edge application scenarios. For this major, petroleum-oriented robots impose higher technical requirements on cutting-edge research directions including complex downhole environment perception, autonomous decision-making and collaboration during drilling and well completion, and automatic inspection of oil and gas fields, while knowledge covering these fields has not been fully incorporated into the curriculum system. Taking the core course Principles and Design of Mobile Robots as an example, besides the basic functions of mobile robots (mobile mechanisms, machine vision, signal transmission, etc.), the new training system should add teaching contents such as motion mechanisms made of high-temperature resistant and shock-absorbing materials, methods to improve visual detection performance under the interference of mud and high-temperature steam, and stable long-distance signal transmission under high temperature and high pressure. Meanwhile, innovations in teaching tools and teaching methods should be advanced simultaneously with the renewal of teaching contents, and the application of AI technology, simulation technology, digital twin technology and other technologies in classroom teaching should be promoted.

(3) The construction of laboratory resources and practical training sessions is still in its initial stage, and the practical teaching needs systematic improvement. After years of teaching practice and educational reform, the Mechanical Engineering major has accumulated abundant teaching materials and practical resources and formed a professional training system. Its Engineering Training Center covers an area of 3,876 square meters and is equipped with 234 teaching and research devices. In terms of overall scale, these hardware facilities and practical platforms have laid a sound foundation for this major.

Robotic Engineering is a highly practice-oriented major, and the petroleum industry sets even higher standards for the practical capabilities of robotics professionals. Nevertheless, practical teaching is a prominent weak point in the current curriculum system, making it difficult to deliver qualified robotics talents for the petroleum sector. Existing practical training activities mainly consist of design assignments attached to basic theoretical courses. For example, the project following

Fundamentals of Mechanical Design merely covers structural design of general reducers and the drafting of 2D engineering drawings. Such practical courses remain confined to fundamental theories and fail to help students expand their robotics knowledge. In addition, the forms of practical teaching are overly monotonous. Within the training program, students have few opportunities to independently design, operate, program, debug and run physical robots for petroleum scenarios. Most of their exposure to robotics relies on simulation software, which deprives them of hands-on experience with real robotic equipment and fails to effectively cultivate their practical competencies in Robotic Engineering. This comprehensive disconnection in both content and format leads to structural flaws in students' practical knowledge systems. After graduation, when students enter petroleum enterprises, companies have to invest enormous costs in retraining them. This reveals severe deficiencies in the pertinence and effectiveness of robotics talent cultivation at petroleum universities, leaving students unable to apply what they have learned and creating a substantial gap between graduate competencies and the practical demands of the petroleum industry.

At present, various robotics discipline competitions have helped undergraduates improve their hands-on practical capabilities. However, for this rapidly developing Emerging Engineering Education major, there is a severe shortage of specialized resources including teaching staff, teaching facilities and practical training platforms. Furthermore, comprehensive and innovative experimental projects tailored to the petroleum-featured Robotic Engineering track are urgently needed to be developed.

(4) The cooperation between universities and petroleum enterprises is insufficiently close and lacks depth, presenting phenomena of "universities being enthusiastic while enterprises remain indifferent" or "sporadic fragmented cooperation", with no long-term and effective university-enterprise cooperation mechanism in place. Most of the "enterprise practice" sessions arranged by the university only organize students to visit production assembly lines of machinery manufacturing plants with weak relevance to the petroleum industry. Due to the limited participation depth of petroleum enterprises, students rarely get

involved in real corporate projects or gain sufficient exposure to authentic on-site operation scenarios during practical training, making it impossible for them to grasp the latest industrial technologies and market demands. Meanwhile, such shallow cooperation creates a disconnect between university research, teaching and corporate technological progress. Enterprises' technical cases and core bottleneck technical problems cannot be timely transformed into classroom teaching cases or graduation design topics. As a result, students lack practical experience in petroleum robotics and possess relatively weak capabilities to solve practical problems under real petroleum industry scenarios.

4. Reform and Construction of Petroleum-Empowered Curriculum and Teaching System

The curriculum system reform of this major shall adhere to the general guideline of “rooted in the industry, highlighting distinctive features, consolidating foundational knowledge, strengthening practical training, promoting interdisciplinary integration, and implementing collaborative talent cultivation”. Driven by the intelligent upgrading demands of the petroleum industry, a systematic restructuring will be carried out covering training objectives, curriculum system, teaching contents, practical platforms and organizational guarantees. The overall curriculum optimization framework is shown in Figure 1.

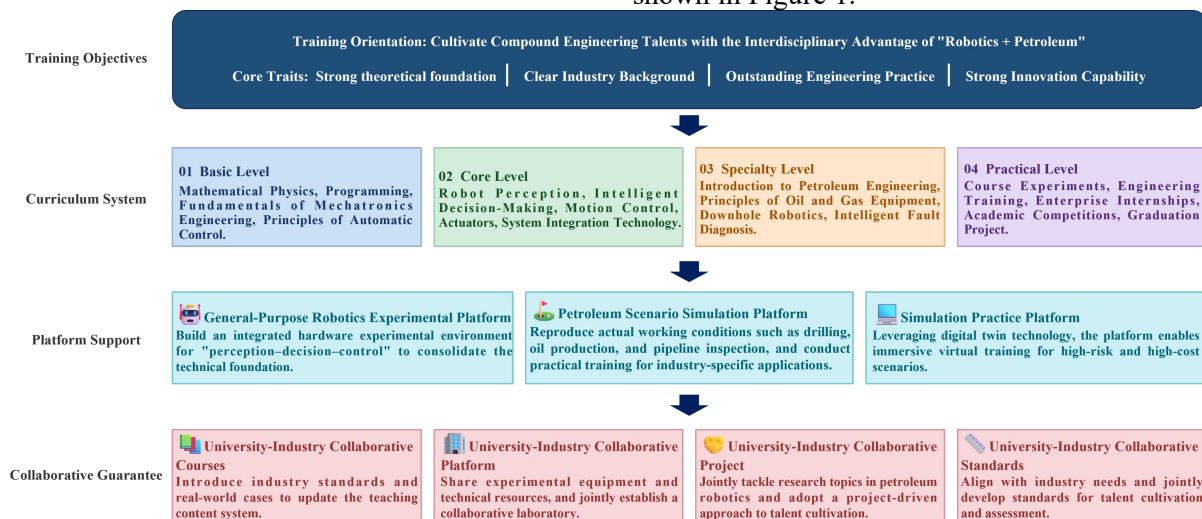


Figure 1. Construction of a Petroleum-Empowered Curriculum and Teaching System for Robotics Engineering

4.1 Clear Training Orientation and “Robotics + Petroleum” Featured Talent Cultivation Goals

Centering on national energy strategies, the intelligent transformation trend of the oil and gas industry and the university’s distinctive industry background, this major integrates the core essence of industrial culture including the Petroleum Spirit and the Iron Man Spirit into curriculum-based ideological and political education. It aims to foster high-caliber application-oriented and interdisciplinary engineering professionals with all-round development in morality, intelligence, physical fitness, aesthetics and labor awareness, who are equipped with solid robotics theoretical foundations, sound engineering literacy and outstanding innovative capacity. Students will master the fundamental theories

and key technologies in robotics engineering; comprehend the primary production scenarios, equipment categories and technological workflows of the petroleum industry; perform modeling, perception, control and integrated design of robotic systems for complex operating conditions; and gain the competence to tackle practical industrial engineering problems and complete interdisciplinary academic writing.

4.2 Reconstruct Curriculum System to Form a Four-Tier Curriculum Framework of “Basic Level – Core Level – Specialty Level – Practical Level”

Drawing on the experience of domestic universities in the construction of emerging engineering curricula [11], this study constructs a four-tier progressive curriculum framework consisting of general basic courses, professional core courses, petroleum characteristic courses

and practical innovation courses in light of the demands for petroleum-featured talent cultivation.

4.2.1 Basic Level: Consolidate General Education and Engineering Fundamentals
Strengthening natural science courses (mathematics, physics, etc.) and engineering foundation courses (engineering drawing, programming, circuit and electronic technology, fundamentals of mechanical design, engineering mechanics, principles of automatic control, microcontrollers and embedded systems, etc.) can be to provide a solid theoretical and technical foundation for modeling, control, perception, and implementation in professional robotics system courses. Meanwhile, engineering fundamental courses should be coherently linked with subsequent robotics courses to avoid isolated content between different courses. Cases integrating the craftsman spirit of hard work and pursuit of industrial excellence shall be moderately incorporated into basic courses to cultivate students' sense of industrial identity and mission.

4.2.2 Core Level: Construct Core Knowledge System of Robotics Engineering

A core curriculum cluster of robotics courses should be developed, including Introduction to Robotics, Robotics, Robot Kinematics and Dynamics, Robot Control Technology, Robot Perception and Machine Vision, Mobile Robot Technology, Machine Learning and Intelligent Decision-Making, Robot Operating System, Path Planning and Autonomous Navigation. A logically coherent and progressively capable knowledge system is built along the main line of "Perception - Decision - Control - Execution - Integration". By sorting out curriculum boundaries and coordinating teaching contents, students can develop a complete professional knowledge network. Case analyses and application-oriented contents related to petroleum scenarios are added to specialized courses, enabling students to establish industrial application awareness while learning general robotics technologies.

4.2.3 Specialty Level: Establish Petroleum Scenario-Featured Course Modules

The characteristic courses can be divided into compulsory modules and elective modules according to the class hours and faculty resources of the major. Foundational courses such as Introduction to Petroleum Engineering

help students build a fundamental understanding of the petroleum industry; cognitive-oriented courses including Petroleum Field Machinery and Drilling and Completion Tools and Equipment familiarize students with the structures and operating principles of typical oil and gas equipment; and technical courses such as Condition Monitoring and Fault Diagnosis of Oil and Gas Equipment and Machine Vision and Multi-sensor Fusion Applications in Petroleum Scenarios enhance students' mastery of the application principles, system design, and engineering practices of robotics technology across the entire petroleum engineering chain. In this way, an effective integration of "technical foundation and industry-specific scenarios" is achieved.

4.2.4 Practical Level: Modules Construct a Multi-level Progressive Practical Teaching System

Throughout the entire four-year undergraduate program, a progressive system comprising "basic experiments - course projects - comprehensive training - enterprise practice - innovation competitions - capstone projects" is established through a series of training activities, including basic robotics cognition, robot disassembly and assembly, AI course projects, comprehensive robotics design practice, enterprise internships, college student innovation and entrepreneurship projects, robotics competitions, and graduation projects. Through practical teaching, the knowledge acquired from courses is transformed into engineering and application competencies, and students' training in solving complex engineering problems is effectively strengthened.

4.3 Practice Platform Enhancement and Petroleum-Featured Robotics Environment Construction

4.3.1 Upgrade of General-Purpose Robotics Experimental Platform

On the basis of the current facilities, such as robotic arms, mobile robots, embedded development platforms, and vision platforms, the hardware and software are upgraded to support fundamental robotics experiments, system integration experiments, and innovative training.

4.3.2 Construction of Petroleum Scenario Simulation Experimental Platform

Drawing on the advantages of the university's

petroleum disciplines, a simulation experimental platform is built to cover typical scenarios including well sites, stations, pipelines, storage tanks, and pump rooms. The platform features functional modules such as inspection tasks, target recognition, leakage detection, path planning, and remote control. By means of scenario-based training, students are enabled to conduct comprehensive practice in near-real environments, thus addressing the diverse learning requirements of students across different years and ability levels.

4.3.3 Construction of Integrated Virtual-Physical Practical Teaching Resources
Virtual simulation technology is fully employed to develop a teaching system that simulates the operation process of petroleum robots. The system allows students to undertake training for high-risk and high-cost petroleum robot tasks within a virtual environment, thus underpinning both specialized courses and research-oriented training.

4.4 Construction of Industry-Education Collaborative Talent Development Mechanism

4.4.1 Co-establishing University-Industry Collaborative Courses

Industry experts from petroleum enterprises are invited to engage in curriculum development and teaching implementation, whereby advanced technologies, practical engineering cases, and enterprise standards are brought into the classroom. A dual-instructor model, featuring both corporate mentors and university teachers, is also explored, with their collaborative participation extending to the formulation of topics and the provision of guidance for graduation theses.

4.4.2 Co-establishing University-Industry Practical Teaching Platforms

Cooperation with enterprises in oil and gas fields, petrochemicals, equipment manufacturing, and intelligent operation and maintenance is enhanced; off-campus internship and practical training bases and joint laboratories are established; and enterprise equipment resources are opened to teaching. Internship contents and practical projects are jointly developed, and an industry-education integration platform for intelligent petroleum equipment is explored, so as to realize the organic integration of classroom instruction with field engineering applications. In this way,

students are provided with opportunities to conduct practice at petroleum production sites, and their engineering capabilities are cultivated.

4.4.3 Co-establishing University-Industry Research-Education Projects

The faculty's petroleum robotics research projects are converted into undergraduate innovation training initiatives, and students are encouraged to engage in research on oil and gas drilling and production robots, intelligent inspection robots, and related topics. Through a virtuous cycle of "research - teaching - practice", students' research competence and innovative abilities are fostered.

4.4.4 Co-establishing University-Industry Talent Cultivation Standards

Talent cultivation standards and a competency evaluation system are jointly developed with petroleum industry enterprises, thereby ensuring that the specifications of personnel training correspond effectively to the requirements of the industry.

5. Conclusion

In the context of Emerging Engineering Education, the development of Robotic Engineering majors must proactively respond to industrial transformation and industry development needs. For Yangtze University, which possesses a distinct petroleum industry background, empowering the curriculum system reform of its robotics engineering program with petroleum characteristics is not only an important pathway to leverage the university's industry-based educational advantages and cultivate distinctive program features, but also a practical necessity for improving the quality of talent cultivation and enhancing its capacity to serve the intelligent transformation of the energy industry.

Grounded in the actual development of the Robotic Engineering major at Yangtze University, this paper addresses industry needs, current problems, and reform directions, and proposes a four-level curriculum framework consisting of the "basic level - core level - specialty level - practical level". It emphasizes the construction of a talent cultivation model characterized by "solid foundation in robotics technology, distinctive petroleum industry scenarios, and outstanding engineering practice capabilities" through the development of course clusters, reorganization and upgrading of teaching content, enhancement of experimental

and practical platforms, and innovation in industry-education collaborative mechanisms. Curriculum system reform is an arduous, long-term, and complex systematic project. In the subsequent stage, continued efforts are needed to deepen research and practice in the development of specialized textbooks, the creation of virtual simulation resources, the cultivation of dual-qualified faculty, university-industry joint course accreditation, and the quality evaluation of talent cultivation, so as to continuously improve the education system for the petroleum-featured robotics engineering program. Looking ahead, as the curriculum system reform progresses steadily, the Robotic Engineering major at Yangtze University is expected to gradually establish a talent cultivation brand with industry recognition and regional influence, thereby supplying high-quality engineering talents for the intelligent development of the petroleum industry.

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