Curriculum Review and Continuous Improvement Mechanism

This document describes the regular curriculum review mechanism, multi-stakeholder participation, and continuous improvement process for programme objectives and graduation requirements.

1.5.10 Regular Curriculum Review and Continuous Improvement

Based on the positioning of applied engineering talent cultivation, closely following the technological iteration, industrial upgrading and job demand changes of the power industry, the programme has established a normalised, institutionalised and closed-loop curriculum plan revision and continuous improvement mechanism, ensuring that the curriculum system, teaching content and practice arrangements are highly aligned with industry standards, technological frontiers and employment demands, and realising the dynamic optimisation and steady improvement of talent training quality. The programme implements a regular revision system of comprehensive review every two years and special spot check every year. The whole process is coordinated and led by the university's Teaching Steering Committee, and specifically organised and implemented by the School of Mechanical and Electrical Engineering. It extensively absorbs the participation of multiple stakeholders, builds a multi-dimensional and all-round teaching quality verification and optimisation system, and continuously consolidates the core competitiveness of programme operation. The overall plan for professional construction and the top-level design of talent training optimisation are strictly aligned with Annex 04.1 Kunming University '14th Five-Year Plan' Special Plan for Professional Construction and Talent Training.

1.5.10.1 Establishment and Implementation of the Revision Mechanism

The talent training scheme and curriculum plan are the core guiding documents for universities to carry out teaching activities, standardise teaching management and ensure education quality, and are an important support for implementing engineering education accreditation standards and achieving programme training objectives. To standardise the whole process of curriculum plan formulation, revision and management, ensure the scientificity, pertinence and practicability of the training scheme, and ensure the accurate implementation of the talent training objectives of this programme, the university strictly clarifies the institutional norms, work procedures and quality standards for curriculum plan review and revision in accordance with the relevant provisions of Annex B-9 Quality Standards for Major Undergraduate Teaching Processes of Kunming University. The curriculum plan of this programme is coordinated by the School of Mechanical and Electrical Engineering and led by the Electrical Engineering Teaching

and Research Office, jointly discussed and formulated by key professional teachers and industry enterprise experts. The formulation process strictly follows Annex B-5 Opinions on Formulating the 2023 Version of Undergraduate Talent Training Schemes of Kunming University. The training scheme is reviewed and improved by industry experts (see Annex B-6 Industry Experts' Review Opinions on Training Scheme), and led by the vice dean in charge of teaching of the school. The school's teaching committee carries out quality monitoring and compliance review throughout the process, ensuring from the source that the teaching system is scientific and compliant, fits industrial needs and adapts to student development. At the same time, relying on Annex B-7 Kunming University Measures for Evaluating the Rationality of Undergraduate Talent Training Objectives and Annex B-8 Kunming University Administration Measures for Evaluating the Achievement of Talent Training Quality, the university regularly verifies the adaptability of training objectives and education effectiveness. The whole process of iterative optimisation and continuous improvement of programme training objectives and graduation requirements is recorded in Annex B-11 Continuous Improvement Record of Training Objectives and Graduation Requirements for Electrical Engineering and Automation Programme.

In terms of the revision cycle, combined with the rapid iteration characteristics of the power industry such as smart grid, new energy power generation, electrical automation and power electronics technology, the programme has established a combination of long-term and short-term review mechanisms: a comprehensive systematic review of the curriculum plan is carried out every two years, covering all modules such as curriculum system, practical teaching, industry-education integration, teaching resources and education effectiveness; a special spot check is conducted every year, focusing on key contents such as emerging technology courses, practical training links, student academic feedback and employment quality changes, so as to timely make up for teaching shortcomings and update teaching content, ensuring that talent training always keeps pace with the forefront of industrial development.

In terms of the revision process, the programme has built a standardised process of 'multi-party participation, multi-dimensional research and judgment, closed-loop optimisation'. The review work invites experts in electrical engineering disciplines from inside and outside the university, technical backbones and managers of power industry enterprises, outstanding alumni representatives, current student representatives and members of the university's teaching supervision committee to participate together. Through various methods such as on-site industry research, concentrated seminars and discussions, collection of teachers' and students' opinions, review of employment data and comparative analysis of curriculum systems, we comprehensively investigate the shortcomings and deficiencies of the current curriculum plan, and accurately judge new changes in industry talent demand and new trends of technological development. Combined with multi-party opinions, the curriculum plan optimisation scheme and revision draft are formed, which are formally implemented after being deliberated by the school's professor committee and reviewed by the university's professional construction

steering committee, ensuring that the revision work is rigorous, standardised and evidence-based.

In terms of revision standards, comprehensive review is carried out in strict alignment with four core bases: first, national higher education standards, running the school in accordance with the National Teaching Quality Standards for Undergraduate Programmes of General Higher Education Institutions (Electrical Engineering and Automation); second, industry technical standards, fitting industry criteria such as State Grid operation and maintenance specifications, electrical engineer vocational qualification standards and power industry safety operation standards; third, industrial development trends, focusing on the development needs of emerging fields such as smart grid, new energy grid connection, intelligent electrical control, power electronics innovation and energy storage technology; fourth, education effectiveness data, taking students' academic achievement, graduate employment rate, employer satisfaction and alumni career development feedback as the core reference, to comprehensively ensure the professionalism and effectiveness of the review work.

1.5.10.2 Multi-stakeholder Participation Mechanism

Adhering to the philosophy of open education and collaborative education, the programme builds a review participation system linking industry enterprises, alumni, current students and peer universities, breaking the limitation of single on-campus review, and realising the in-depth connection of curriculum plan revision with industry demand, student demands and advanced school-running experience.

Industry enterprises deeply participate in the revision of industry-education integration. The programme has long-term cooperation with partner units such as Yunnan Power Grid Co., Ltd., China Energy Investment Corporation Yangzonghai Power Generation Co., Ltd., mainstream electrical equipment manufacturing enterprises in the province and new energy power generation enterprises, and regularly invites enterprise technical backbones, production managers and project leaders to participate in teaching review work. Combined with enterprise job requirements, practical difficulties of engineering projects and new standards of industry talent ability, targeted improvement suggestions on curriculum setting optimisation, practical link upgrading and skill training focus are put forward, promoting the precise docking of classroom teaching content with enterprise production practice and core job ability requirements.

Alumni feedback empowers the dynamic optimisation of teaching. A regular alumni research and feedback mechanism has been established to continuously track the career development trajectory of graduates of all cohorts, and systematically collect alumni's work experience and learning feedback in positions such as power system operation and maintenance, electrical equipment R&D, new energy project construction and automation engineering management and control. Focus on sorting out the application effect of curriculum knowledge in engineering practice and the new skills and literacy requirements required by positions, so as to provide real industry practice basis for curriculum plan revision, curriculum content update and practice system improvement.

Current students participate in teaching evaluation throughout the process. Through diversified forms such as course questionnaires, special teacher-student seminars, class opinion collection and academic assistance interviews, students' opinions and suggestions on the rationality of curriculum setting, practicability of teaching content, adaptability of teaching methods, sufficiency of practical resources and teaching level of teachers are regularly collected. Fully respect the dominant position of students in learning, optimise teaching arrangements based on students' academic growth demands, and improve the adaptability and education temperature of the teaching system.

Peer universities collaborate to promote professional quality improvement. Long-term cooperation with electrical engineering related majors in provincial universities such as Kunming University of Science and Technology and Yunnan Minzu University, inviting discipline leaders and senior professors to participate in teaching review work, benchmarking the school-running mode, curriculum system and education characteristics of similar high-quality majors in the province, learning from advanced teaching reform experience, making up for the shortcomings of the programme's school-running, and ensuring the scientificity, compatibility and industry foresight of the curriculum system.

1.5.10.3 Core Content of Comprehensive Review

This revision of the curriculum plan covers the whole chain of talent training, focusing on four core modules: curriculum system, practical teaching, industry-education integration and teaching resources, to conduct all-round investigation and systematic optimisation of the education system.

The review of the curriculum system focuses on core nature and cutting-edge nature. Focus on verifying the completeness of professional core courses, ensuring full coverage of main courses such as Circuit Theory, Analog Electronic Technology, Digital Electronic Technology, Electrical Machinery, Power System Analysis, Electrical Control and PLC, Power Electronics Technology, Principles of Automatic Control and High Voltage Technology, with reasonable class hour allocation and coherent knowledge system. At the same time, strictly check the update of curriculum frontiers, verify whether emerging content such as smart grid technology, new energy power generation technology, intelligent electrical equipment, industrial automation control systems and energy storage technology is effectively integrated into curriculum teaching, eliminate the problems of lagging curriculum content and aging knowledge system, and ensure that the curriculum system keeps pace with industrial technological iteration.

The review of practical teaching focuses on effectiveness and adaptability. Comprehensively check the class hour proportion, content design, assessment standards and implementation quality of the whole chain of practical links such as course experiments, course design, on-campus engineering training, off-campus cognitive internship, special training, graduation internship and graduation thesis (design). Focus on verifying whether the practical teaching content fits the real engineering scenarios of power enterprises, electrical equipment manufacturing

enterprises and automation enterprises, and whether it can effectively exercise students' practical abilities such as equipment operation, system commissioning, troubleshooting and engineering design, ensuring that the practical teaching system can support the training objectives of applied engineering talents.

The revision of industry-education integration and internationalisation focuses on depth and breadth. On the one hand, verify the operation effectiveness of school-enterprise cooperation training bases and industry-education integration projects, check the implementation of collaborative education modes such as enterprise tutor teaching, project-based training and enterprise-based research, and promote the in-depth integration of practical teaching with enterprise production and engineering projects; on the other hand, review the effectiveness of curriculum internationalisation construction, check whether teaching content integrates cutting-edge content such as international electrical technical standards, cross-border power cooperation and overseas new energy engineering cases, sort out the channels and opportunities for students' international exchanges, academic visits and cross-border training, and continuously broaden students' international vision and cross-regional engineering competitiveness.

The revision of teaching methods and resources focuses on diversity and guarantee. Systematically evaluate the innovation of classroom teaching modes, verify the application effectiveness of diversified methods such as case teaching, project-based teaching, simulation teaching, online-offline hybrid teaching and discipline competition-enabled teaching, and judge whether the current teaching mode can effectively stimulate students' innovative thinking and engineering practice ability. At the same time, comprehensively verify the allocation of software and hardware resources such as on-campus professional laboratories, simulation teaching platforms, online learning resources and school-enterprise co-construction training bases. The daily operation, safety management and use specifications of laboratories strictly follow Annex D-3 Laboratory Management System, and the selection, construction and management of teaching materials are implemented with reference to Annex C-5 Kunming University Administration Measures for the Construction and Management of Undergraduate Professional Textbooks (Revised), fully supporting the teaching, training and scientific research work of teachers and students. The whole-process management of practical teaching is strictly implemented in accordance with Annex C-4 Kunming University Undergraduate Practical Teaching Management System (Revised). Details of on-campus and off-campus training base construction and school-enterprise cooperation resources are shown in Annex D-1 Electrical Professional Internship and Training Base Situation and Annex D-2 Representative Off-campus Enterprise Cooperation Agreements for Electrical Engineering Programme.

1.5.10.4 Implementation of Revision Results and Continuous Improvement

Since the establishment of the programme, it has strictly implemented the two-year teaching revision system. Relying on the results of multiple rounds of revision feedback, it has continuously carried out iterative optimisation of the talent training system, achieving all-round upgrading in training objective positioning, curriculum system

construction, practical teaching reform and teaching mode innovation, and steadily improving the quality of talent training.

Talent training objectives continue to be iterated accurately. Combined with the intelligent, digital and green transformation and upgrading trend of the power industry, and relying on the industry talent demand data fed back from previous reviews, the training objectives of this programme have been accurately optimised and upgraded, from the traditional focus on basic skill training to the focus on digital and intelligent compound engineering ability training. The newly revised training objectives clearly state that based on the needs of regional economy and power industry development, the programme cultivates high-quality applied engineering and technical talents with all-round development of morality, intelligence, physical fitness, aesthetics and work ethic, solid mastery of basic theories and professional skills in the field of electrical engineering and automation, capabilities of power system operation and regulation, electrical automation control, new energy power generation application, engineering design and project management, as well as innovation awareness, engineering literacy and sense of social responsibility, who can engage in design, installation, commissioning, operation and maintenance, management and other work in the fields of power energy, electrical equipment manufacturing and new energy industry, accurately adapting to the needs of industrial transformation and upgrading and regional industrial development.

The curriculum system is dynamically iterated and optimised. Based on the industry frontiers and student demands fed back from the review, the programme continuously optimises the curriculum structure: adding cutting-edge courses such as smart grid technology, new energy power generation technology and intelligent monitoring of electrical equipment to make up for the shortcomings of education in emerging fields; optimising the class hour allocation of core courses, reducing redundant theoretical content and increasing the proportion of practical training hours; integrating cross-repetitive curriculum content and adding interdisciplinary integrated teaching modules; synchronously integrating certification content such as electrical engineer vocational qualifications and industry safety specifications to help students' career development and certified employment.

Teaching and practice modes have been deeply innovated. Relying on the review improvement requirements, comprehensively promote the reform of teaching modes, regularly introduce real engineering cases in the power industry, electrical simulation software and enterprise project materials into classroom teaching, and strengthen the practicality and pertinence of teaching; deepen the effectiveness of the dual-supervisor education system, continuously expand off-campus school-enterprise cooperation training bases, and enrich students' channels for on-the-job internships and project training; fully implement project-based and task-based teaching, guide students to learn oriented to solving real engineering problems, and effectively improve students' engineering practice and innovation capabilities.

The closed-loop feedback improvement effect is remarkable. The programme has established a full closed-loop mechanism of review result announcement, opinion feedback, rectification implementation and effect review, and synchronously feeds back the review conclusions and optimisation measures to professional teachers, industry experts, current students and alumni groups, clarifying rectification responsibilities, refining implementation plans and regularly verifying the improvement effect. After multiple rounds of continuous optimisation, the pertinence and practicability of professional teaching have been greatly improved, teachers' teaching is more in line with industry reality and the accuracy of education has been significantly enhanced; students' professional identity, learning gain and employment confidence continue to improve, and they can quickly realise the transformation and connection between theoretical knowledge and engineering practice; employers generally feedback that graduates of this programme have solid foundation, quick start, strong adaptability and excellent comprehensive quality, and can quickly be competent for various electrical positions. The programme's educational reputation and industry recognition continue to improve. At the same time, the regular evaluation, rectification and optimisation of curriculum objective attainment are strictly implemented in accordance with Annex C-3 Kunming University Measures for Evaluating the Attainment of Curriculum Objectives, and the achievement of talent training quality is fully benchmarked against Annex B-8 Kunming University Administration Measures for Evaluating the Achievement of Talent Training Quality.

1.5.10.5 Process Archiving and Information Transparency Mechanism

The programme attaches great importance to the standardised management of the whole process of teaching review, and has established a complete process archiving and information disclosure mechanism to ensure that the review work is standardised, transparent, traceable and verifiable. In terms of document recording, a complete set of materials for each round of review is fully retained, including meeting minutes, review opinions of industry experts, teacher-student research and feedback reports, teaching problem lists, rectification and optimisation schemes, implementation records and effect review reports, realising the whole-process traceability of the review work, and providing a complete basis for continuous professional improvement, teaching quality assessment and accreditation review.

In terms of information transparency, through multiple channels such as teacher-student seminars, teaching presentations, professional talent training manuals, freshman orientation education and official website announcement, the programme actively discloses teaching review results, teaching optimisation measures and professional construction achievements to current teachers and students, applicants and cooperative enterprises, fully demonstrating the construction achievements of continuous improvement and quality improvement of the programme, and actively accepts the supervision of teachers, students, enterprises and the society, fully demonstrating the standardisation, openness and rigor of the programme's school-running.