Programme Self-Assessment Report

About Academic Degree

Bachelor of Energy and Power Engineering

Prepared by: Professor Zhu Qunzhi

School of Energy and Mechanical Engineering

Shanghai University of Electric Power

1851 Hucheng Ring Road, Pudong New Area, Shanghai

www.shiep.edu.cn

2020/10/08

Contents

1. Introduction of the Major

Table 1-1 Introduction of the Major

Name of the Major (in Chinese)	能源与动力工程
Name of the Major (in English)	Energy and Power Engineering
Final Degree	Bachelor of Engineering
Standard Length of Schooling	Four Years
Credits (According to ECTS)	240
Type (can have several expressions)	Full-time Learning Course
Higher Education Institution Website	http://www.shiep.edu.cn/
(First Time) Start date of the Major within the academic year	1 September 1985
Start semester	Autumn semester
Expected number of enrollments	180-200
Amount and type of expenses/charges	RMB5,000 per academic year
School/Department	School of Energy and Mechanical Engineering
Department website	https://energy.shiep.edu.cn/main.htm
Official contact posted on the web	Professor and Doctor Zhu Qunzhi
Tel	+86-13371895985
Email	zhuqunzhi@shiep.edu.cn

2. Teaching Philosophy and Implementation

2.1 Cultivation objectives

According to the *Opinions of Ministry of Education on Accelerating the Construction of High-Level Undergraduate Education and Comprehensively Improving the Ability to Cultivate Talents* (J.G. [2018] No. 2), the *Opinions of Ministry of Education, Ministry of Industry and Information Technology and Chinese Academy of Engineering on Accelerating the Construction and Development of New Engineering Courses and Implementing Excellent Engineer Education Training Plan 2.0* (J.G. [2018] No. 3) and *Shanghai Higher Education Distribution Structure and Development Plan (2015-2030)* (Shanghai Education Commission [2015] No. 186) and other requirements, the overall talent cultivation objective of Energy and Power Engineering major is cultivating high-level talents of "engineering, innovation and internationalization", which is established based on Shanghai University of Electric Power's school-running policy of "based on electric power, application and front line" and school-running philosophy of "pragmatic and practical, sensible and far-reaching", in conjunction with the national energy strategy, the development needs of power industry, the needs of Shanghai's social and economic development, and the laws of higher education.

Relying on power industry, this major aims to train outstanding engineers with good social adaptability, international vision and engineering practice capabilities, and cultivate application-oriented technical talents with healthy personality, good physique, solid basic theories and professional knowledge, who have innovation awareness and team awareness, strong capabilities in engineering practice, independent working, learning, understanding and communication, as well as broad international vision. They are expected to engage in the design, manufacture, installation, operation and management related to power generation, thermal energy engineering, energy conservation, environmental protection, and new energy in the field of energy and power, and to meet the requirements of internationally recognized engineer qualifications and engineer vocational qualifications, thus laying a solid foundation for obtaining internationally recognized engineer qualifications. Three modules are set for professional ability training

- ✧ Orientation of power plant thermal energy and power: master the knowledge and skills related to advanced power generation technology, power plant operation and control technology, power plant monitoring and diagnosis technology, and be competent in the design, manufacture, installation, operation, management and scientific research in the field of power plant thermal energy and power engineering at the production frontline.
- ✧ Orientation of clean power generation technology: master the knowledge and skills related to the generation and treatment of pollutants, clean power generation technology and renewable energy, and be able to engage in the design, manufacture, installation, operation, management, teaching and scientific research related to environmental protection, clean production, and new energy power generation in energy and power industry and related fields.

- ✧ Orientation of energy conservation and energy management: master the knowledge and skills related to energy conservation technology and equipment, distributed energy systems, energy management and auditing, and be able to engage in the scientific research, technology development, and management in the field of energy conservation and energy management.

2.2 Target output of cultivation and learning

2.2.1 Knowledge, technology and engineering abilities acquired through professional cultivation

(1) Knowledge

1) General knowledge:

- ♦ Master the basic knowledge of mathematics, physics, chemistry, foreign languages, etc.;
- ♦ Possess humanistic and social knowledge and the cognition of international and national situation;
- ♦ Have knowledge of sports and military.

2) Engineering knowledge:

- ♦ Master the basic knowledge of computer and information;
- ♦ Master the basic knowledge of mechanics, drawing and mechanical design;
- ♦ Master the basic knowledge of electric and automation;
- ♦ Master the basic engineering knowledge of engineering management;
- ♦ Master the basic knowledge of fluids and heat.

3) Professional knowledge:

- ♦ Master the structure, principle, function and operation knowledge of equipment and systems in power generation industry;
- ♦ Master the knowledge of safe production in power generation industry;
- ♦ Understand the frontier development and hot issues of power generation industry.

(2) Technology

1) Operation ability:

- ♦ Possess basic engineering operation skills and basic professional experimental skills;
- ♦ Be able to perform primary operation of the main equipment and systems of a power plant;
- ♦ Have the ability to disassemble, assemble, and repair the main auxiliary equipment of a power plant.

2) Analysis ability:

- Have the ability to cooperate with computer software and networks, and the ability to effectively obtain and use information;
- Have the basic ability to process and analyze experimental and practical data;
- Be able to effectively obtain and analyze various data in the production process of a power plant, and analyze and diagnose the operation effects of power plant equipment and systems;
- Have the ability to understand contemporary social and technological hot issues from the perspective of power generation companies.

3) Design ability:

- Possess the ability of professional basic experiment and professional experiment design and implementation;
- Preliminarily possess the ability to design, calculate and analyze the main equipment and systems in power generation industry.

(3) Ability

1) Teamwork and management ability

- Have healthy psychology and personal character;
- Have a good sense of law and social responsibility;
- Have good communication and coordination skills, and teamwork spirit.

2) International exchange ability

- Have sufficient English knowledge and the ability to apply foreign language skillfully;
- Be able to conduct professional international exchanges;
- Have sufficient cross-cultural knowledge and be able to work in and cooperate with foreign or multinational companies.

3) Vocational development ability:

- Have the ability in re-learning, continued education and scientific research;
- Have a full understanding of the vocational responsibilities and vocational ethics of power generation industry.

2.2.2 Professional evaluation and requirements

1) Program evaluation

Energy and Power Engineering is a national-level feature major. It has the right to grant master's degree for power engineering and engineering thermophysics and the right to grant master's degree for power engineering. It is among the first batch of "pilot majors for professional comprehensive reform" selected by the Ministry of Education. In 1951, Power Department, the predecessor of Energy and Power Engineering was established. In 1985, the

University entered undergraduate schooling level with the approval of Ministry of Education. From then on, the major of thermal energy and power engineering began to recruit 4-year undergraduates and 3-year junior college students. In 2014, the major of thermal energy and power engineering was renamed as Energy and Power Engineering. In the same year, Power Engineering master's degree program was approved and began to recruit students. In 2018, Energy and Power Engineering was selected as a core major in the leading program of first-class undergraduate construction by Shanghai colleges and universities, and in 2019, Energy and Power Engineering was selected as Shanghai municipal first-class undergraduate major construction project. Experts agree that, after construction, this major has proposed the talent cultivation courses and practical teaching system that meet the talent needs and vocational standards of power production industry, by referring to the national standards for energy and power teaching quality and power industry standards, based on the talent needs of enterprises. A cultivation model has been established for applied undergraduate talents in the field of energy and power engineering, which has distinctive characteristics, great influence and promotion value, and reflects the docking with power demand.

2) Job market demand

Energy and Power Engineering graduates have strong ability of professional practice, solid professional knowledge and basic industry knowledge, good adaptability and innovation awareness, and high comprehensive ability, so they are widely recognized in the job market. They are able to engage in the design, manufacture, installation, operation, research, development and management in enterprises, research institutions, universities, design institutes and government departments in such industries as energy supply, power production, power generation equipment and so on. The main employers for graduates include China Huaneng Group Co., Ltd., China Datang Corporation Ltd., China Huadian Corporation, State Power Investment Corporation Limited, China General Nuclear Power Corporation, China National Nuclear Power Co., Ltd., Power Construction Corporation of China, Shenergy Group Co., Ltd., Zhejiang Energy Group Co., Ltd., China Energy Engineering Group Co., Ltd., Shanghai Electric Group Company Limited, etc. The employment rate of graduates is over 97%.

3) Graduate survey

The feedback results from the survey of graduates majoring in Energy and Power Engineering show that the curriculum of this major is reasonable and closely related to the demand of the job market. The graduates have strong adaptability and are welcomed by employers, indicating that the expected learning effect is fully achieved.

More than 90% of the graduates are satisfied with the current employment situation and have a good employment experience. At the same time, the degree of relevance between the work and the major of graduates is about 80%, reflecting that the university's professional training objective is well achieved. In addition, the quit rate of undergraduate graduates is less than 20%, indicating that the employment stability of graduates is strong. On the whole, the employment situation of graduates in the short term is relatively good, which has laid a good

foundation for medium and long-term vocational development.

2.3 Course modules

2.3.1 Training mode

The entire curriculum system is divided into nine course modules, namely: national situation cognition/social cognition (humanities and society), vocational development ability, international exchange (language learning), science foundation, engineering foundation, professional foundation/engineering application, industry development, bachelor's thesis, practice.

(1) National situation cognition/social cognition (humanities and society)

Enable students to establish correct social and historical views and life values, have good moral cognition and sound legal awareness, and recognize the importance of social environment in engineering practice; have good humanities and artistic accomplishments, aesthetic taste, and the skills in writing and speaking.

(2) Vocational development ability

Enable students to have good physical and psychological qualities, have the ability to communicate and cooperate with others; understand industry development status and trends and national policies; have a good understanding of engineering ethics and vocational ethics, and have the initial awareness of innovation and entrepreneurship, to lay a foundation for personal development after graduation.

(3) International exchange (language learning)

Enable students to master foreign languages and pass the College English Test Band 4; have the ability to read professional materials and foreign language communication, as well as the skills in cross-cultural and international cooperation and communication.

(4) Science foundation (mathematics, physics and chemistry modules)

Enable students to master the basic knowledge of mathematics, physics and other natural sciences, deepen their understanding of natural sciences, and improve their scientific accomplishments in solving practical problems in science and technology applications, thus laying a solid foundation for future professional learning.

(5) Engineering foundation

Master a wide range of basic engineering knowledge and skills to lay a solid foundation for future learning of professional courses.

① Computer and Information

Enable students to master the basic knowledge of computer and information technology, and use computer technology and tools to effectively solve practical problems in the field of engineering technology, so as to lay a solid foundation for future learning.

② Economic Management

Enable students to understand the basic concepts of engineering economic analysis, and have a certain understanding of the role of economic analysis in engineering practice, thus be aware of the impact of economic issues on engineering in future studies.

③ Electric and Automation

Enable students to have basic knowledge and skills in electric and automation control, as well as certain experimental capabilities, to lay a foundation for students' follow-up course study.

④ Mechanics and Machinery

Enable students to understand the basic knowledge of engineering mechanics, metal materials, and their processing technology and mechanical design, master basic engineering terminology, basic mechanical engineering drawing, experimental skills and analysis methods, and apply technical information to solve practical engineering problems, to lay a necessary foundation for follow-up course study.

⑤ Fundamentals of Fluids and Heat

Enable students to understand the basic concepts, laws and analysis methods of fluid flow, thermodynamics, heat transfer and combustion, and apply these theories and methods to engineering problems such as energy conversion and utilization, providing necessary basic theoretical knowledge for learning of subsequent professional courses.

(6) Professional Foundation/Engineering Application

Enable students to understand the basic knowledge such as structure and working principles of the main equipment and systems in the industry, master basic professional experimental skills and operational skills, and be able to apply theoretical knowledge to the actual production process of engineering, and conduct preliminary engineering design and calculation analysis, laying a good foundation for installation, operation, commissioning, design improvement, development and research of power station equipment and systems.

(7) Industry Development

Enable students to understand the relevant core and cutting-edge professional knowledge and skills in industries and fields such as power plant energy and power, clean power generation technology, energy conservation and energy management, and lay a foundation for design, manufacture, installation, operation, management and scientific research in relevant

industries in the future.

(8) Graduation Project/Graduation Thesis

Enable students to integrate knowledge, skills and abilities, propose solutions and solve practical problems, and complete graduation project tasks. Each student needs to independently complete the graduation project tasks and complete the graduation thesis under the guidance of the graduation project tutor.

(9) Practice: In-class experiment (including comprehensive experiment and design experiment), independent course experiment, course design, professional internship, professional training (according to students' willingness, which can be verified,see Appendix L)

Students are expected to learn the production process, main equipment and system design methods, installation technology, operating characteristics and control methods of power generation enterprises, so as to further verify and consolidate theoretical knowledge and methods, and acquire the ability to apply theoretical knowledge to industry and engineering production.

2.3.2 Course matrix

Table 2-1 Energy and Power Engineering Target Matrix

Excellent learning objectives	**Expected learning outcomes of the entire program** **- Knowledge** **- Skills and expertise** **- Competency**	**Corresponding module/module objective (theory + practice of each module)**		
Have good civic qualities and establish a correct outlook on life and values.	1. Understand China's current social patterns and social norms, realize self-worth and have a teamwork spirit. 2. Understand social ethics and legal systems, establish a correct outlook on life and values, solve practical problems encountered on the road to success, and promote all-round development.	**Theoretical courses:** Ideological and Moral Cultivation & Legal Basis, Outline of Chinese Modern and Contemporary History, Mao Zedong Thought and Introduction to the Theoretical System of Socialism with Chinese Characteristics, Situation and Policy **Practice:** social practice	History and current situation, policies and regulations	National situation cognition /social cognition
Have good vocational qualities and sense of vocational	1. Understand the development status and trends of power industry, and national policies	**Theoretical courses:** Energy China, Light of Silk Road, Introduction to Energy and Electricity, Foundation of	Industry cognition	Vocational development ability

responsibilities	2. Understand the connotation of engineering ethics, have the initial awareness of innovation and entrepreneurship, and be able to make preliminary career planning.	Innovation and Entrepreneurship, Engineering Ethics, Career Planning and Employment Guidance **Practice:** Entrance education, cognition practice, social practice in class		Vocational ethics and competence	
Physical and psychological qualities, communication and cooperation ability	Master sports and military theories and teamwork spirit; form healthy personalities and good mental abilities	**Theoretical courses:** Mental Health for College Students, Military Theories **Practice:** sports Military Training		Physical and Mental Health	
Master the skills in cross-cultural and international cooperation and communication, to adapt to social development and internationalization.	Master a foreign language and pass the College English Test Band 4; have the ability to read professional materials and communicate in foreign languages.	**Theoretical courses:** College English, Specialized English for Power **Practice:** Read and translate foreign documents related to bachelor degree thesis, and write English abstract for bachelor degree thesis, etc.		Language learning	International exchange
Acquire basic knowledge on mathematics, natural sciences, and information technology to lay a solid foundation for subsequent courses, and cultivate students' ability to acquire and apply knowledge and to innovate.	Understand natural science and have the ability to use mathematical models to solve various practical problems in science and engineering applications.	**Theoretical courses:** Advanced Mathematics, Linear Algebra, Probability Theory, Calculation Methods, College Physics, General Chemistry **Practice:** physical experiment, chemical experiment (in class)		Mathematics, Physics and Chemistry	Science foundation
Master a wide range of engineering knowledge and skills to lay a solid foundation for future professional courses.	1. Master the basic skills of computer-aided engineering design, calculation and simulation. 2. Have basic concepts and awareness of engineering economic analysis. 3. Master the basic theories, knowledge and engineering foundation of Energy and Power Engineering.	**Theoretical courses**	Computer Network Technology Fundamentals, Programming Fundamentals	Computer and Information	Engineering Foundation
			Project Budget, Project Management	Economic Management	

	4. Have the ability to make experimental plans, conduct experiments, analyze and interpret experimental data.		Introduction		
			Electrical and Electronic Technology, Automatic Control Principle	Electric and Automation	
			Mechanical Drawing, Fundamentals of Mechanical Design, Engineering Mechanics, Metal Materials	Mechanics and Machinery	
			Fluid Mechanics, Engineering Thermodynamics, Heat Transfer, Engineering Combustion	Heat and Fluids	
		Practice: engineering training, course experiment, basic course design of mechanical design, professional practice of computer modeling practice			
Acquire engineering knowledge, practical ability and operational skills in the professional orientation of Energy and Power Engineering.	1. Apply professional knowledge to propose, analyze and solve problems in practice. 2. Be able to accurately describe the research problems, set up a calculation analysis model, and complete and summarize project content, so as to lay a solid foundation for subsequent course learning and engineering applications.	**Theoretical courses**	Pump and Fan, Steam Turbine Principle, Boiler Principle	Professional Equipment	Engineering Applications
			Centralized control operation of thermal power plants and unit plants	Production system	
		Practice: Boiler Principle Course Design, Steam Turbine Principle Course Design, Thermal Power Plant Course Design, Simulation practice			
Obtain the latest cutting-edge expertise and skills in energy and power engineering industry/power	Master new methods and technologies in this field; apply relevant scientific knowledge to participate in scientific research and technological development related to energy and power engineering projects.	**Theoretical courses**	Advanced Power Generation Technology, Power Plant Operation and Control	Power Generation Technology	Industry Development

generation industry, and have certain innovation capabilities.			Technology, Power Plant Monitoring and Diagnosis Technology	
			Generation and Treatment of Pollutants, Clean Power Generation Technology, Renewable Energy Power Generation	Clean Production
			Energy-saving Technologies and Equipment, Distributed Energy Systems, Energy Management and Auditing	Energy Conservation Management
		Practice: Graduation internship, student sci-tech innovation project, graduation project		
		Graduation Project		

2.4 Social prospects and relevance between major and employment

2.4.1 Social positioning

Modern technology and social development requires engineering graduates to possess proficient engineering and practical skills, scientific and technological innovation capabilities, and the ability to discover and solve practical engineering problems. Since 1980s, Western developed countries represented by the United States have launched an engineering education reform with "engineering education in the context of large-scale engineering" as the main content. For China, in order to meet the needs of enterprises and society for the cultivation of applied, composite and innovative senior engineering talents, it is very urgent to reform the training model of higher engineering education talents, pay attention to ability, strengthen engineering practice teaching links, and launch modern engineering practice training for students.

The Energy and Power Engineering of Shanghai University of Electric Power is an energy and power major under distinct background of power generation industry. It cultivates high-quality application-oriented talents for production frontline of the power industry, especially the power generation industry. It emphasizes foundation, attaches importance to practice,

combines theoretical knowledge with the application of advanced technologies based on the needs of modern power production development, and highlights knowledge application capabilities, scientific and technological innovation capabilities, and the organic integration of production, education, research and application. These are the key points of the professional talent training system built for this major.

With national economic development and social progress, our country has established a new energy strategy that is "to comprehensively improve energy efficiency, vigorously develop new and renewable energy, and promote the clean and efficient development and utilization of fossil energy." At the same time, the power generation technology of the power generation industry has undergone a transformation from traditional power generation methods to efficient and clean modern power generation methods. Generator sets have also transformed from ultra-high pressure/subcritical high parameters to supercritical/ultra-supercritical parameters, and the demand for talents is becoming more and more diversified and multilevel.

According to the employment situation of graduates in recent years, graduates mainly serve in the fields related to "electricity and heat production and supply", "manufacturing", indicating the outstanding advantages and distinctive characteristics of power industry. Graduates mainly choose to work in Shanghai and serve the local economic development. The areas with more employment outside Shanghai are Jiangsu Province, Zhejiang Province and Anhui Province. This provides talent support and intellectual support for the economic and social development of Shanghai and the Yangtze River Delta.

2.4.2 Practical ability

Facing the demand for production frontline engineers in power generation industry, with ability cultivation as the core, a practical teaching system (as shown in Figure 2-1) is established around the design, manufacture and operation of energy equipment and systems to meet the needs of teaching practice for students. Please refer to Appendix P for some signed cooperation agreements.

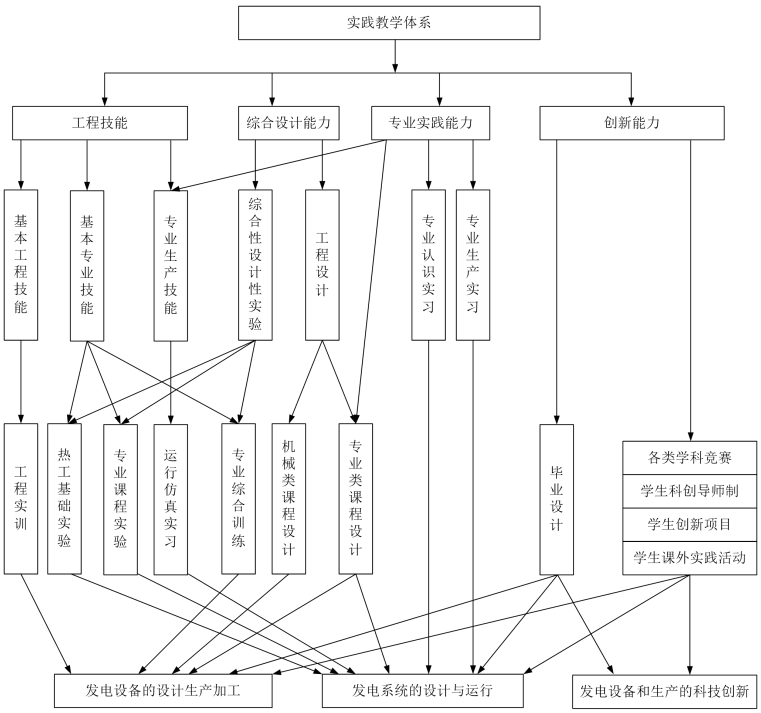


Figure 2-1 Practice teaching system

实践教学体系	Practical teaching system
工程技能	Engineering skills
综合设计能力	Comprehensive design ability
专业实践能力	Professional practice ability
创新能力	Innovation capacity
基本工程技能	Basic engineering skills
基本专业技能	Basic professional skills
专业生产技能	Professional production skills
综合性设计性实验	Comprehensive design experiment
工程设计	Engineering design
专业认识实习	Professional cognition internship
专业生产实习	Professional production internship
工程实训	Engineering training
热工基础实验	Basic thermal experiment
专业课程实验	Professional course experiment
运行仿真实习	Operation simulation internship
专业综合训练	Professional comprehensive training
机械类课程设计	Mechanical course design
专业类课程设计	Professional course design
毕业设计	Graduation project
各类学科竞赛	Various subject competitions
学生科创导师制	Student science innovation tutorial system
学生创新项目	Student innovation project
学生课外实践活动	Students extracurricular activities

发电设备的设计生产加工	Design, production and processing of power generation equipment
发电系统的设计与运行	Design and operation of power generation system
发电设备和生产的科技创新	Technological innovation of power generation equipment and production

(1) Engineering skills: including basic experimental skills for engineering majors, experimental skills and innovation capabilities for the practical applications in electric power production, and practical skills for production frontline.

- ✧ Engineering training: A preliminary understanding of the basic knowledge of metal processing technologies; familiarity with the main metal processing methods, understanding of the equipment and tools used, and preliminary operating skills.
- ✧ Basic experimental skills: train students' basic experimental skills through basic course experiments; train students' experimental skills for practical production applications through professional course experiments.
- ✧ Simulation practice: With the help of modern computer simulation technologies, students can conduct generator set operation practice on the simulation system of large thermal power generation 300MW subcritical units, 600MW supercritical units, and 1000MW ultra-supercritical units, and train their practical capabilities for the first-line production of power generation enterprises, so that they acquire the ability to obtain primary vocational qualification certificates, and can quickly adapt to the actual operation of power plants.

(2) Comprehensive design ability cultivation: including basic engineering design ability and quality, modern power generation equipment and system design ability.

- ✧ Course design for mechanical design fundamentals: master the general methods and steps of mechanical equipment design, cultivate the basic skills of mechanical design, and be familiar with standards and specifications. Through the design, students can improve their comprehensive application ability of the theoretical knowledge of each prerequisite course, acquire the ability to consult various technical materials such as standards, specifications, manuals, etc., and also receive comprehensive and systematic training of independent working ability, which can lay a foundation for students' learning and solving practical engineering problems in subsequent engineering practice.
- ✧ Boiler principle course design: master the standards and methods of boiler thermal calculation, be able to consult relevant materials and documents proficiently, improve basic skills such as calculation, drawing and computer calculation, cultivate engineering calculation ability and comprehensive analysis ability, and cultivate their serious and responsible attitude towards technical skill issues.
- ✧ Steam turbine principle course design: summarize, consolidate and improve the theoretical knowledge obtained in the course of Steam Turbine Principles. Through the comprehensive application of the learned knowledge, carry out the thermal calculation and structural design of steam turbine, write a thermal calculation manual, and draw the longitudinal section of steam turbine flow passage, enabling students to get a comprehensive and systematic training of independent working ability.

- ✧ Thermal power plant course design: apply theoretical knowledge to an actual power plant production system, master the calculation of system energy balance, and apply the basic theories and methods of thermal economic analysis to calculate and analyze the thermal economics of various thermal systems; get familiar with the conventional calculation methods of principle thermal system of power plants, understand the composition of the comprehensive thermal system of power plants; train students' ability to consult and use relevant national design standards and codes, carry out actual engineering design, and reasonably select and analyze data; enhance engineering concepts, and cultivate students' serious and responsible attitude towards engineering and technical issues.

(3) Professional practice ability cultivation: work closely with power generation companies to guide students in a full range of practical learning from power generation equipment manufacturing, installation and maintenance to generator set operation.

- ✧ Cognitive internship/professional internship: understand the role and status of power plants in national economy, establish a basic professional outlook; understand the production process, systems and main production equipment of thermal power plants; understand the basic knowledge about safe production at power plant maintenance sites or installation sites, and strengthen attention to safety and equipment concept; get familiar with the layout of power plants, and understand the interconnection of production workshops; get familiar with the type, function and working process of the main equipment of power plants.

(4) Cultivation of innovation ability: Make full use of the university's existing teaching, scientific research and laboratory resources; has built corresponding innovative experimental bases or laboratories, and established a practical base for college students' innovation projects.Some awards are detailed in Appendix O.

- ✧ Student innovation management system: The "University Student Energy Conservation and Emission Reduction Innovative Activity Implementation Group" and the "University Student Innovation Activity Steering Group" have been established. Relevant energy conservation and emission reduction innovation activity plan management measures, capital management measures, and relevant provisions on project application, mid-term examination, and conclusion. Encourage students to participate in various innovation competitions, improve the level of students' innovation organization and management, and increase the participation rate of teachers and students.
- ✧ Innovative ability training methods: Infiltrate the ideological concepts of scientific and technological innovation education in the course teaching, cultivate students' ability to analyze and solve problems, teach students creative learning methods, and integrate scientific and technological innovation education. Relying on open laboratories and scientific research experimental platforms, provide students with design and comprehensive experiments that can be independently selected, and improve students' practical ability and innovation ability.

(5) Graduation project and graduation thesis: Bachelor's degree graduation project and graduation thesis include topic review, free selection of topic, thesis proposal argumentation, in-process inspection, thesis writing, plagiarism check, and thesis defense, etc., aiming to strictly

control the content and quality of bachelor's thesis, and ensure that the thesis reaches the expected quality.

2.5 Admission requirements

2.5.1 Admission requirements

Students who intend to join the undergraduate courses of Shanghai University of Electric Power and obtain a bachelor's degree must take the National Uniform Enrollment Examination for ordinary institutions of higher learning in the People's Republic of China or the enrollment examination for institutions of higher learning held in relevant provinces or cities. Those who meet the following conditions can apply for registration: (1) Comply with the Constitution and laws of the People's Republic of China; (2) Graduate from a senior secondary education school or have an equivalent education level; (3) Physical condition meets relevant requirements.

2.5.2 Admission procedure

Chinese universities can basically be divided into three levels: at the first level, there are a total of about 70 higher education institutions directly under the Ministry of Education of the PRC; at the second level, there are about 100 provincial and ministerial joint-built key universities and provincial key universities; at the third level, there are other ordinary universities, and Shanghai University of Electric Power is at this level.

The provincial admission office dispenses archives of the students who apply for our university, from high scores to low scores (including extra points) according to our university's local enrollment plan and archive dispensing proportion. The specific archive dispensing proportion is determined by our university according to the actual source of students in each province and city, the archive dispensing mode and relevant policies of the provincial higher education admission office. Our university's professional admission adopts the principle of score priority, and there is no difference the candidates for different majors, that is, candidates are admitted according to the order of their choices from high scores to low scores and based on college entrance examination score. For specific admission scores, refer to Appendix R.

2.5.3 Transparency in admission

In accordance with the *Education Law of the People's Republic of China* and *Higher Education Law of the People's Republic of China*, colleges and universities as well as provincial admissions offices should implement the admissions work in accordance with the principle of "schools are responsible and the admissions office play the role of supervision". Colleges and universities should conduct admissions in accordance with the admission rules included in the admission regulations announced to the public. For candidates who have passed the ideological and political morality assessment, with physical conditions meeting relevant professional training requirements, and their scores meeting the admission control scores of the same batch and meeting the university's archive transfer requirements, whether to admit and the major to admit are determined by universities, and universities are responsible for giving reasons to candidates whose

archives have been dispensed to the universities but finally rejected. Universities shall not conduct admissions beyond approved plan. Provincial-level admissions office is responsible for supervising the implementation of national admissions policies and admissions plans of admissions colleges in the region, and correcting violations of national admissions policies, regulations and admission rules.

2.5.4 Admission reform

Since the Ministry of Education launched the reform of autonomous admissions by colleges and universities in 2003, some universities have the right to enroll certain candidates by self-proposed exam instead of the unified national examination for general college admissions, or select and enroll students who have passed the comprehensive assessment according to the relevant regulations of the Ministry of Education.

Candidates enrolled in the foregoing manner and other candidates enrolled through national and provincial unified examination have exactly the same student status and enjoy the same teaching program. However, the proportion of students enrolled in the foregoing manner should be strictly controlled within 5% of the pilot school's target annual undergraduate enrollments, to ensure that the vast majority of candidates are enrolled through ordinary manners.

So far, Shanghai University of Electric Power has not adopted the above-mentioned admission manner.

3. Degree Education

3.1 Structure and modularity

3.1.1 Modularity

According to the training objectives of this major, the course system of this major includes nine modules. The learning objectives and corresponding courses are as follows:

(1) National situation cognition/social cognition (humanities and society)

Learning objectives: have correct social and historical views and life values, good moral cognition and sound legal awareness, as well as good humanities and artistic accomplishments, aesthetic taste, and the skills in writing and speaking.

General requirements: understand the country's history, current situation and international environment, understand the basic structure of the country's laws, and actively participate in social practice.

Corresponding courses: Outline of Chinese Modern and Contemporary History, Ideological and Moral Cultivation & Legal Basis, Mao Zedong Thought and Introduction to the Theoretical System of Socialism with Chinese Characteristics, Situation and Policy, Humanities and Arts Courses

(2) Vocational development ability

Learning objectives: Have a certain understanding of industry development and career planning, and have the initial awareness of innovation and entrepreneurship; physically healthy, with good mental state; strong adaptability, tolerance and teamwork spirit; lay the foundation for future personal development.

General requirements: understand the development status and trends of power industry, and national policies; understand the connotation of engineering ethics, have the initial awareness of innovation and entrepreneurship, and be able to make preliminary career planning; master the basic theories about sports and military; participate in physical exercise and necessary military training, reach college students' physical exercise standards and improve students' comprehensive ability.

Corresponding courses: Energy China, Introduction to Energy and Electricity, Engineering Ethics, Fundamentals of Innovation and Entrepreneurship, Career Planning and Employment Guidance, Sports, Military Theory and Military Training, Mental Health of College Students, Entrance Education.

(3) International exchange (language learning)

Learning objectives: Demonstrate the skills in cross-cultural and international cooperation and communication.

General requirements: Master a foreign language and pass the College English Test Band 4 (CET-4); have the ability to read professional literatures and communicate in foreign languages.

Corresponding courses: College English, Specialized English, Technical English Reading and Writing.

(4) Science foundation (mathematics, physics and chemistry modules)

Learning objectives: master the basic principles about mathematics, physics and other natural science courses, to lay the foundation for engineering foundation courses.

General requirements: be able to use the basic theoretical knowledge of natural sciences learned, to analyze scientific problems extracted from engineering practice.

Corresponding courses: Advanced Mathematics (integral, calculus), Linear Algebra, Probability Theory, Calculation Methods, College Physics, College Physics Experiment, College Chemistry.

(5) Engineering foundation

① Computer and Information

Learning objectives: have basic knowledge ABOUT information technology and computer science; use computer programs to solve engineering problems

General requirements: Use computer and information technology to solve practical problems in the field of engineering technology related to what you have learned.

Corresponding courses: Computer Network Technology Fundamentals, Programming Fundamentals, Computer Modeling Practice.

② Economic Management

Learning objectives: have the basic concepts and awareness of engineering economic analysis

General requirements: have a certain understanding of the role of economic analysis in engineering practice, thus be aware of the impact of economic issues on engineering in future studies.

Corresponding courses: Project Budget, Project Management Introduction

③ Electric and Automation

Learning objectives: have basic knowledge and basic skills in electrical and automation control subjects, have certain experimental capabilities, and be able to obtain scientific results through data processing.

General requirements: master the basic concepts, basic theories and basic methods of electrical circuits and automatic control; acquire necessary basic skills and certain experimental capabilities; learn to use data processing theory to complete data processing and obtain scientific results; lay a foundation for students' follow-up courses.

Corresponding courses: Electrical and Electronic Technology (I), (II), Automatic Control Principle, Computer Distributed Control System

④ Mechanics and Machinery

Learning objectives: Have the ability to draw and read engineering drawings, master the characteristics and mechanical analysis methods of commonly used metal materials, be able to design basic general-purpose mechanical mechanisms, and have the basic ability to use standardized engineering language and technical information to solve practical engineering problems.

General requirements: master the methods of drawing and reading engineering drawings, be familiar with the composition and structure of commonly used metal materials, and the relationship between processing technology and performance, be able to apply general theorems of mechanics to solve some simple engineering problems, master the working principles and characteristic of general mechanical parts, and the basic knowledge about applications and design calculations, and have the ability to consult and use relevant technical data such as standards, specifications, manuals, and atlases.

Corresponding courses: Engineering Mechanics, Metal Materials, Mechanical Drawing A, Fundamentals of Mechanical Design, Basic Mechanical Design Course

⑤ Fundamentals of Fluids and Heat

Learning objectives: master the basic theories and analysis methods of fluid flow, thermodynamics, heat transfer, and combustion, understand common problems in engineering, be able to apply these theories and methods to the cognition and analysis of engineering problems, providing necessary basic theoretical knowledge for subsequent professional courses.

General requirements: master the basic laws of fluid flow, fuel combustion, heat transfer, mass transfer, and energy conversion and transfer, be able to understand and analyze relevant engineering issues; master relevant basic experimental skills and parameter measurement and data processing methods; have the preliminary ability for modeling and analysis of energy transformation and utilization.

Corresponding courses: Engineering Thermodynamics, Engineering Combustibility, Fluid

Mechanics, Heat Transfer, Thermal Engineering Test Technology,

(6) Engineering Applications

Learning objectives: master the basic knowledge, engineering application and analysis methods about main equipment and systems in power generation industry (field), have basic professional experimental skills and operational skills, and lay a good foundation for installation, operation, commissioning, design improvement, development and research of power station equipment and systems.

General requirements: master the basic concepts, working principles, structure, performance, and operation adjustment of the main equipment in power generation industry, such as boilers, steam turbines, pumps and fans, and master the structure and operation mechanism of the entire power generation system composed of equipment. Master the basic principles and methods of equipment and system calculation and analysis, understand the latest developments of relevant technologies at home and abroad, be able to complete basic experiments and operations, and be able to perform preliminary engineering design, calculation analysis and energy-saving optimization of equipment and systems.

Corresponding courses: Pump and Fan, Steam Turbine Principle, Boiler Principle, Thermal Power Plant, Unit Centralized Control Operation, Thermal Energy Engineering Test Technology

(7) Industry Development

Learning objectives: master relevant knowledge and skills such as advanced power generation technology, power plant operation and control technology, power plant monitoring and diagnosis technology, master the knowledge and skills related to the generation and treatment of pollutants, clean power generation technology, renewable energy power generation, and master knowledge and skills related to energy-saving technology and equipment, distributed energy systems, energy management and auditing, laying a good foundation for future design, manufacture, installation, operation, management, and scientific research in related industries.

General requirements: Industry development subject is an elective module, including three modules such as power generation technology courses, clean production, and energy-saving management. Students can choose their own suitable modules in the sixth semester and complete the corresponding modules in the sixth, seventh and eighth semesters.

Corresponding courses: Gas Turbine and its Combined Cycle, Supercritical and Ultra-supercritical Parameter Units, Digital Electro-hydraulic Control Technology and Application, Power System Condition Monitoring and Diagnosis Principles, Renewable Energy Power Generation Technology, Clean Coal Technology, Energy and Air Pollution Control Technology, Introduction to Distributed Energy System, Energy Management and Audit, Introduction to Energy-saving Technology, Waste Heat Boiler, Heating Network Technology, Air Conditioning, Refrigeration Principles and Equipment.

(8) Bachelor's thesis/graduation thesis

Learning objectives: having the ability to analyze and solve engineering problems based on graduation project tasks is an important way to improve practice and innovation ability.

General requirements: Under the guidance of the graduation project tutor, comprehensively use the basic theories and professional knowledge learned in this subject to conduct preliminary training in engineering design or research, complete graduation project tasks, write thesis and pass the defense.

Corresponding courses: Bachelor's degree thesis.

(9) Practice

Learning objectives: understand basic machining and manufacturing methods, and have basic practical skills; be familiar with the production process of power generation industry, master the characteristics and operation skills of key equipment and systems, and be able to design and analyze relevant equipment and systems.

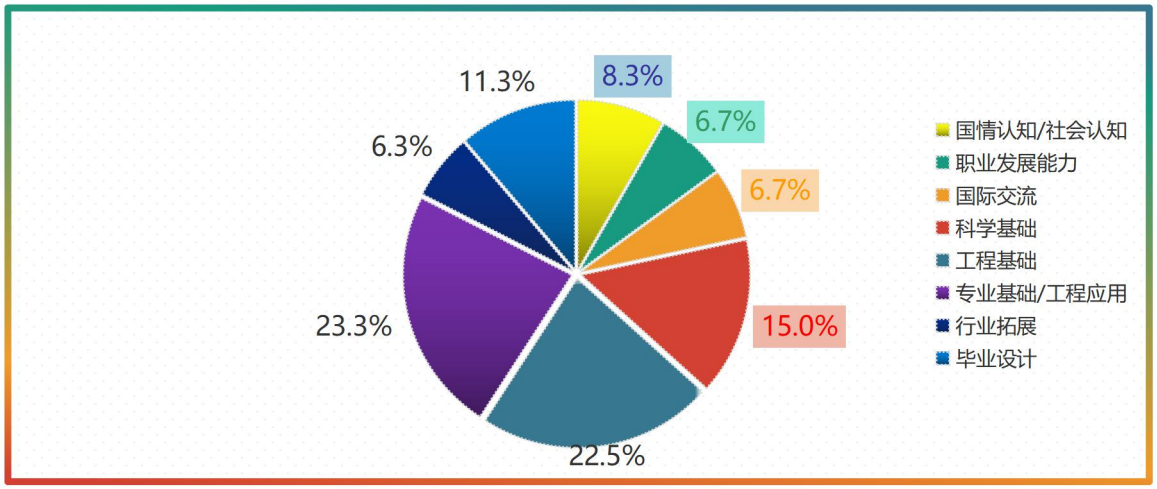
General requirements: have the ability to integrate and apply theoretical knowledge and practical skills to solve industry engineering problems; be familiar with the design, installation and operation of major equipment and systems in the industry, and business management; enhance engineering concepts, and train students to be serious and responsible about engineering and technical issues.

Corresponding courses: Engineering Training, Professional Experiment, Basic Mechanical Design Course, Boiler Principle Course Design, Steam Turbine Principle Course Design, Thermal Power Plant Course Design, Production Practice, Simulation Practice, Student Project, Innovation and Entrepreneurship Project Training.

3.1.2 Course structure

According to the credits and workload distribution of each module, national conditions cognition/social cognition, professional development ability and language courses have been established in the 1st-4th semesters, including English, philosophy, sports, industry, military, etc., to familiarize students with English, humanities, law and career and improve their cross-cultural communication skills, social awareness, professional awareness and humanities. In the 1st-5th semester, basic science modules have been arranged, including mathematics, physics, chemistry and informatics modules, so that students can master the basic knowledge and skills of learning professional courses. In the 1st-6th semester, basic engineering modules have been arranged, including engineering knowledge and skills related to drawing, mechanics and machinery, electrical and control, heat and fluids, computer and information, thus laying the foundation for subsequent engineering applications and professional modules. The engineering application module is arranged in the 5th-7th semesters, involving energy and power engineering professional courses. This module is essential in the entire course system. The industry expansion module is

arranged in the 6th-8th semesters. This is an elective module that offers different courses for different program orientations, and this module deepens and expands the engineering application module. Graduation internship and graduation project/graduation thesis are arranged in the 7th-8th semesters. The subject of the graduation project/thesis comes from the scientific research project in charge or the actual engineering project of an industrial enterprise. Internship and graduation project/graduation thesis can help students accumulate a lot of practical engineering experience and improve their employment competitiveness. According to the class schedule, students will eventually get 240 credits in 8 semesters of study.



国情认知/社会认知	National situation cognition/social cognition	20	8.3%
职业发展能力	Vocational development ability	16	6.7%
国际交流	International exchange	16	6.7%
科学基础	Science foundation	36	15.0%
工程基础	Engineering foundation	54	22.5%
专业基础/工程应用	Professional foundation/engineering application	56	23.3%
行业拓展	Industry development	15	6.3%
毕业设计	Graduation project	27	11.3%

3.2 Workload and credits

At Shanghai University of Electric Power, the completion of a 16-hour theoretical module course is equivalent to one Chinese credit, which is approximately equivalent to 1.5 ECTS credits (except for language teaching and general education courses). In the practice module, completing (20) hours of study is equivalent to one Chinese credit, which is approximately equivalent to 2 ECTS credits. Chinese credits only count contact time, while ECTS credits count not only contact time, but also self-study time. From the perspective of ECTS credits, a student's study workload is the sum of his/her contact time and self-study time. Generally speaking, 30 study hours (including contact time and self-study time) are equivalent to 1 ECTS credit, although there are differences between the foregoing two self-study time credit systems. After converting Chinese credits into the ECTS credit system, the average credits for one academic year are 60 ECTS credits or 1800

study hours (workload).

3.2.1 Study time (workload)/contact time, credits and self-study

The credits for all modules are detailed in Appendix D "Courses". The syllabus of each course is provided in Appendix B "Module Manual". Table 3-1 provides statistics on the study time of all modules in four years.

Table 3-1 Student study time statistics

	Contact time	**Self-study time**	**Total study time**
Total contact time (excluding language, politics, sports)	1884	2736	4620
Language Course	192	168	360
Sports, Politics	272	238	510
Total	2348	3142	5490
Internship	500	460	960
Bachelor Thesis	280	470	750
Total study time	3128	4072	7200
h/CP (study time/credits):			30/1
Required course	2776	3374	6150
Elective course	352	698	1050
Total (the total study time of required courses and elective courses)	3128	4072	7200
Specialty course	912	1818	2730
Non-specialized courses (excluding language courses)	1244	1156	2400
Language Course	192	168	360
Total (sum of the foregoing three study time)	2348	3142	5490

3.2.2 Credit system

Learning results are mainly reflected in the form of credits. After completing four years of study, students must obtain the Chinese credits equivalent to 240 ECTS credits, that is, an average of 30 ECTS credits per semester. The credit difference between different semesters should not exceed 3 ECTS credits. The workload of each semester is relatively balanced and should not cause structural pressure on the quality of student training and the teaching level of teachers. The course

teacher analyzes the test results, and the counselor and the head teacher survey students' study time to obtain the actual study amount of students each semester and ensure that their actual study amount is consistent with the planned workload. Each student must complete approximately 900 study hours (workload) per semester. Generally speaking, 30 learning hours (workload) are equivalent to 1 ECTS credit.

3.3 Education methods

Basic natural science courses are mostly taught in large classes (about 100 students), while professional basic courses are usually taught in medium classes (about 60 students). Some professional courses are taught in small classes (about 40 students). Most course modules include theoretical knowledge and experiments. Experimental courses are usually conducted in groups in batches. Advanced course modules are elective modules, and students can choose such modules according to their own interests and development needs.

In addition to classroom teaching, practice and training are also important ways of undergraduate education. Most course modules have corresponding experimental and practical projects. We have a national practice teaching base, a key laboratory of clean power generation and environmental protection technology for machinery industry, and a municipal experimental teaching demonstration center in Shanghai. We have established a "power industry simulation training base (thermal power)" jointly with China Electricity Council, built "off-campus practice base for professional development education of electric power talents" jointly with Shanghai Waigaoqiao Third Power Plant, and established practice centers jointly with some long-term cooperative companies, which can provide more than 400 students with practical opportunities each year. The proportion of double-professionally-titled teachers reaches 60%, and many of them have professional qualifications. Create conditions for students to obtain professional qualification certificates. Compared with the same program of any other university, we have better practical training conditions. Each student must participate in innovation and entrepreneurship training, a six-week internship and a twelve-week bachelor degree thesis. In addition, students can also choose teacher’s research projects for practical research.

3.4 Support and suggestions

1) Management

The daily management and support of the university’s undergraduate teaching and training are mainly in the charge of the Academic Affairs Office. There are ten departments under the Academic Affairs Office: Academic Affairs Office, Teaching Research Center, Course Selection and Examination Center, Academic Affairs Department, Teaching Information and Quality Assessment Department, Teaching Practice Department, Textbook Department, Teacher Teaching Development Center, Innovation and Entrepreneurship Center, Printing Center.

University Teaching Management Information System website: https://jwc.shiep.edu.cn/

In the university, each school has a dedicated teaching office under the guidance of the

deputy dean in charge of teaching, and such teaching office is responsible for the teaching management of the school.

2) Student office

The Student Office is responsible for guiding and supporting the ideological and political education and management of the entire school's students, including: formulating and improving various rules and regulations related to student work; comprehensively promoting quality education, improving the overall quality of students, maintaining normal teaching order, and creating good teaching atmosphere; responsible for daily affairs management such as undergraduate student status management, file management, and violation handling; instructing, coordinating and evaluating the student management work of each school; organizing and implementing awards, help, loans, part-time job, subsidies, reductions and other student support work; responsible for students' career development education and employment guidance process management services; responsible for student dormitory management and student publicity, education, counseling, etc.; organize and carry out student work-related education training and theoretical research.

3) Student counselor system

Each grade is equipped with 2 full-time undergraduate counselors, responsible for college students' ideological and political education and value guidance, party group and class construction, study style construction, students' daily affairs management, mental health education and consultation, online ideological and political education, campus crisis response, career planning and employment guidance, theoretical and practical research, etc., to build bridges and ties between the university and student families, between students and teachers, and between students and various functional departments. They organize various learning activities to create a strong learning atmosphere; organize various cultural and sports activities to enrich students' after-school life; help students fully understand the status quo of professional development and future career directions, and help every college student have clear and specific learning objectives and quality development goals; organize enterprise visits and internships, career interviews, professional lectures and other career exploration activities to help students clarify personal professional knowledge, abilities and qualities. According to students' different career development directions (postgraduate entrance examination, employment, going abroad), organize activities such as experience exchange on postgraduate entrance examination, employment situation analysis, and go-abroad policy consultation; organize resume guidance, simulation of interview, recruitment presentations to help students improve their actual application ability. In addition, provide students with comprehensive employment services such as corporate recruitment information, employment policy information, and graduation process guidance on a regular basis; encourage college students to participate in various scientific innovation and entrepreneurship competitions, and invite experienced teachers or corporate personnel to organize project application guidance and skills training from time to time, aiming to help students improve their innovation and practical capabilities.

4) Head teacher

Each undergraduate class is equipped with a head teacher, and the head teacher is responsible for only one natural class, which lasts for four years. Head teachers must have certain teaching and work experience, high academic level and rich scientific and cultural knowledge, and strong business and work ability. Professors, associate professors and lecturers with doctoral degrees are preferred. Head teachers understand and grasp the dynamics of students' thoughts through class meetings, forums, class theme activities, lectures, and special seminars, guide students to establish a correct world outlook, outlook on life, and values, and communicate with the school and student counselors in time regarding students' study and other related matters. Head teachers need to care about and value the learning of students, help students clarify learning objectives, take serious learning attitudes, master learning methods, obey learning rules, and establish a good class learning atmosphere; carry out guidance on school history, professional background, subject development, and employment prospects, to stimulate students' thirst for knowledge and enthusiasm for learning; do a good job of guiding college students' innovative practical activities, cultivate students' innovative awareness and ability, and strive to improve students' comprehensive quality.

5) Course website

Online teaching is widely used. There are corresponding course pages on the university's website, introducing the syllabus of the course, recommended textbooks, learning resources, teacher resumes, etc. Students can find information related to the course online, and they can also ask the teacher questions on the online platform, WeChat, QQ or email. The School has established a corresponding experimental teaching website: the experimental center website of the School of Energy and Mechanical Engineering: https://energy.shiep.edu.cn/syzx/list.htm, https://spgc.shiep.edu.cn/ And there is an open laboratory appointment system: http://10.166.18.23/, all laboratories are open to students.

6) Academic tutors and corporate tutors

The university implements undergraduate innovation and entrepreneurship programs, and encourages students to train their innovation and practical skills through innovation projects or participating in teacher research projects. The university implements a tutor system for undergraduates, including academic tutors and corporate tutors. Academic tutors are professors and associate professors at the forefront of scientific research. Students can choose their favorite academic tutors based on their professional knowledge and research interests, and academic tutors can also choose students. Finally, the academic tutor is determined through two-way selection. During study, academic tutors will guide students to carry out relevant activities and academic research based on their personal strength and interests, and will provide constructive opinions for students' academic research. The corporate tutor is responsible for guiding students’ projects during the corporate internship, and maintaining communication with academic tutor for teaching cooperation.

4. Exam: System, Concept and Organization

4.1 Exam method

Assessment is an important means to check students' mastery of the courses they have learned and to measure teaching effects. Course assessment standards must be fair. All courses stipulated in the teaching plan must be assessed. Practical teaching links such as internships, curriculum design, graduation project (thesis), and independent experiment courses must also be assessed. According to the requirements of Shanghai University of Electric Power Undergraduate Course Teaching Management Regulations (H.D.Y.J. [2017] No. 73), the course assessment methods are divided into written tests and non-written tests. Non-written test refers to the assessment in the form of completing large-scale assignments, designs, thesis, etc.; written test refers to the assessment in the form of closed-book or open-book test. The assessment of theoretical courses includes closed-book written test, open-book (half-open-book) written test, computer-based skills test and non-written test (essay, report, oral test, etc.). The assessment of a course can be conducted in one or several ways. Course design, independent experiment courses and graduation project (thesis) are generally assessed by a combination of teacher review and on-site defense.

The score recording is divided into three forms: a hundred-point system, a five-level system, and a grade system. Course exams are generally scheduled to take place during the final exam week. The test scores are based on the final exam scores, with appropriate reference to the usual scores. The usual scores can be determined in the form of usual homework, learning attitude, classroom participation, course essays, etc. The usual scores generally account for no more than 30% of the course scores. If grades are recorded in a hundred-point system, no decimals are kept, and they are rounded off. Other matters related to the examination shall be implemented in accordance with the Administrative Measures for the Examination of Shanghai University of Electric Power (H.D.Y.J. [2016] No. 129). A score system is used for the overall evaluation of student courses. A list of student scores is provided in Appendix N.

Students' graduation project (thesis) (including graduation internship and graduation defense) starts from the eleventh week of the second half of the seventh semester to the entire eighth semester. Each second-level college, according to its own professional characteristics and teaching conditions, arrange and organize graduation project (thesis), and complete the graduation project (thesis) in accordance with the teaching requirements with quality and quantity guaranteed. Graduation project (thesis) scores are generally composed of three parts, namely the tutor’s evaluation score, the review teacher’s evaluation score, and the graduation defense score (5:2:3 or 4:2:4). The school can clarify the proportion of the three parts' grades to the graduation project grades according to the characteristics of subjects, formulate corresponding implementation rules, submit them to the Academic Affairs Office for filing and review before implementing them.

4.2 Examination organization

Examination is an important part of teaching management and an important content of

teaching quality management and evaluation. The principles of fairness, justice, honesty and rigor should be adhered to. Examinations should be organized in accordance with Shanghai University of Electric Power Examination Management Measures (H.D.Y.J. [2016] No. 129). The detailed rules are provided in Appendix E.

5. Resources

5.1 Participants

5.1.1 Staff composition

This major is based on power engineering and engineering thermophysics. It has introduced and trained talents in key development areas such as power plant thermal equipment and operation, power plant pollutant control, new energy technology, nuclear power technology, and established a team of about 40 full-time faculty members, with academicians of Australian Academy of Technological Sciences and Engineering as the leaders. The team is composed of various talents such as New Century Excellent Talents in University, outstanding academic leaders in Shanghai, Shanghai "Oriental Scholars" distinguished professors, "Young Oriental Scholars", Shuguang Scholars, Young Technology Star, Outstanding University Teachers in Shanghai, Pujiang Scholar and so on. The faculty is mainly composed of young and middle-aged backbone teachers, with excellent academic background and qualifications. The proportion of double-professionally-titled teachers is about 20%, and we have 2 Shanghai municipal-level teaching teams. The resumes of all teachers are provided in Appendix A.

5.1.2 Scientific research and development by staff

Taking the core courses of Energy and Power Engineering major as the mainstay, five teaching teams have been formed: boiler teaching team, steam turbine teaching team, unit teaching team, thermal power plant teaching team and nuclear power teaching team. A professional course group has been established, and a course leader responsibility system under the leadership of the teaching team leader has been formed, to coordinate the planning and construction of the course group. In recent years, it has completed 4 course construction projects above the city level and 9 teaching reform projects, and published 10 textbooks.

The school has strong scientific research team and high research level in the clean and efficient use of conventional energy (combustion and pollutant control, power generation system energy saving, etc.), new energy and multi-energy complementation (solar photovoltaic thermal utilization, wind power generation, distributed energy and microgrid, etc.). In the past five years, the school has undertaken and participated in more than 300 national, provincial and ministerial-level scientific research projects including national project 973, project 863, science and technology support plan, key research and development plan, and national natural science fund project. A list of relevant research projects is provided in Appendix C. We have won more than 10 provincial and ministerial technical inventions and scientific and technological progress awards, published more than 200 high-level papers including ESI highly cited papers, which are included in SCI and EI, and more than 100 authorized national patents. The school actively carries out domestic and foreign academic exchange activities, and has established relatively close cooperative relations with famous universities in the United States, the United Kingdom, and Japan. We focus on the combination of production, education and research, and jointly carry out postgraduate training and scientific research, which effectively enhances the influence and level of

the school.

In 2019, many achievements of the cooperation between Energy and Power Engineering major and enterprises have successively won 1 second prize of China Machinery Industry Science and Technology Progress Award, 1 third prize of China Electric Power Science and Technology Award, and 2 third prizes of Shanghai Science and Technology Progress Award. Among them, the achievement "Key technologies and applications for environmental protection of power plants based on the entire process of coal-fired flue gas pollutant control" carries out the study on key technologies for environmental protection of collaborative removal of power plant coal-fired flue gas pollutants from the entire process of coal-fired units, which has formed 60 patents, of which 40 are invention patents; 20 software copyrights have been obtained; more than 80 highly cited papers including ESI have been published. After the achievement is implemented, the environmental protection indicators are in the world's leading position, and the achievement is at international advanced level. It serves Belt and Road countries, and more than 230 domestic and foreign application manufacturers.

In the past three years, the number of students participating in the "National College Student Energy Conservation and Emission Reduction/Social Practice and Technology Competition" and other competitions has reached more than 730. 78 persons have won international honors, and 165 have won municipal honors, achieving double breakthroughs in terms of the number of science and technology innovation winners and the award-winning level.

Table 5-1 and Table 5-2 list the high-quality courses and the publication of professional textbooks and monographs of Energy and Power Engineering major.

Table 5-1 Professional Quality Courses

No.	Course name	Name of reward or support	Granting department	Approving time
1	Thermal power plant	City-level quality courses among Shanghai universities	Shanghai Municipal Education Commission	2017
2	Mechanics of Materials	City-level quality courses among Shanghai universities	Shanghai Municipal Education Commission	2016
3	Engineering Fluid Mechanics	Key Undergraduate Course of Shanghai Municipal Education Commission	Shanghai Municipal Education Commission	2017
4	Mechanical Design	Key Undergraduate Course of Shanghai Municipal Education Commission	Shanghai Municipal Education Commission	2017
5	Principles of Boiler	City-level quality courses among Shanghai universities	Shanghai Municipal Education Commission	2009
6	Principles of Steam Turbine	City-level quality courses among Shanghai universities	Shanghai Municipal Education Commission	2012
7	Engineering Thermodynamics	Key Course of Shanghai Municipal Education Commission	Shanghai Municipal Education Commission	2010

8	Heat Transfer	Shanghai Quality Course	Shanghai Municipal Education Commission	2010

Table 5-2 Professional teaching materials and reference books

No.	Course name	Name of reward or support	Approving time	Publishing house
1	High Temperature H2S Removal from IGCC Coarse Gas	Project Funded by National Natural Science Foundation of China	2017	Shanghai Jiaotong University-Springer Press
2	Vortex Burning	Applied undergraduate construction project	2017	China Electric Power Press
3	Mechanics of Materials	Applied undergraduate construction project	2017	Xidian University Press
4	Theoretical Mechanics	Applied undergraduate construction project	2016	Xidian University Press
5	Boiler Energy Saving Technology	Enterprise commissioned project	2017	China Electric Power Press
6	Course Design for Thermal Power Plants	Applied undergraduate construction project	2018	China Electric Power Press
7	Green Thermal Power Technology	Publishing house level	2019	Shanghai Jiaotong University Press
8	Advanced Coal Combustion Technology and Practice	Publishing house level	2019	Shanghai Jiaotong University Press
9	Clean Energy Technology and Application	Publishing house level	2019	Shanghai Jiaotong University Press
10	Distributed Energy Technology and Application	Publishing house level	2019	Shanghai Jiaotong University Press

5.1.3 Employee's rated workload

The teaching workload of each professional employee in the school is 300 hours per year. In addition to necessary theoretical teaching, each employee must also provide students with sufficient extracurricular Q&A, homework correction, innovation and entrepreneurship guidance. Serving as a head teacher and providing scientific and innovative guidance for students of this major is regarded as an important reference for employee promotion.

These measures ensure that every student in the major can obtain sufficient guidance on relevant courses and extracurricular homework, so as to help them complete the courses required by the major, obtain the various abilities required by the energy and power engineering plan, and achieve the training goals set in the training program.

5.2 Employee development

5.2.1 Relevant training

The School of Energy and Power Engineering and the School of Mechanical Engineering provide professional teachers with various training opportunities, so that teachers can acquire sufficient ability to engage in the development of energy and power engineering subjects and professional teaching. Such training includes: the university arranges a one-month pre-job training for new teachers every year to improve their ethics and professional skills.

The university has implemented "Shanghai University of Electric Power Young and Middle-aged Academic Backbone Training Program (H.D.Y.R. [2009] No.34)". The university strives to witness more people being selected into various national, ministerial and municipal talent programs after five years of training, apply for more national-level scientific research projects, and create a group of subject or academic leaders that have good political ideas, noble teacher's ethics, rigorous scholarship, solid work style, strong professional foundation, strong sense of innovation, and certain influence in the same subject at home and abroad.

At the same time, the university also cultivates double-professionally-titled teachers with international perspectives, and has established a training mechanism for double-professionally-titled teachers. The university plans to send personnel under the age of 45 in this program to enterprises for internship of one year. It is stipulated that only lecturers with at least one year of practical experience in corporate engineering can be awarded a senior title. Only those candidates with one year of academic research experience abroad will be awarded the title of professor.

Every professional teacher has the opportunity to study abroad. Every year, 3-5 teachers in the program will receive funding from the Shanghai Municipal Education Commission to receive one-year training and study abroad. The university encourages teachers, especially young teachers, to receive training and study abroad. Shanghai University of Electric Power provides financial and personnel support to encourage teachers to study or receive training abroad.

Table 5-3 lists the names of teachers of Energy and Power Engineering major who study abroad. Table 5-4 lists the names of teachers who have cooperated with enterprises and received training.

Table 5-3 List of persons studying abroad

No.	Name	State	University/institution	Duration	Form of learning
1	Hu Danmei	United States	National Renewable Energy Laboratory of USA	2010	Visiting scholar
2	Wang Chengyao	UK	University of Nottingham	2019.9-2019.12	Visiting scholar

3	Zhang Tao	UK	University of Nottingham	2019.1-2019.12	Visiting scholar
4	Wu Jiang	United States	University of Kentucky	2005.2-2006.11	Visiting scholar
5	Qiu Zhongzhu	UK	University of Hull	2013-2014	Visiting scholar
6	Li Fangqin	Australia	University of Sydney	2007	Visiting scholar
7	Zhang Li	Hong Kong	Hong Kong Polytechnic University	2002.2-2002.5	Visiting scholar
8	Liu Fang	United States	Purdue University	2007-2009	Postdoctor
9	Liu Qingrong	Japan	Kyushu University	2007-2009	Postdoctor
10	Zhu Qunzhi	United States	Georgia Institute of Technology	2000-2004	Study for a doctorate
11	Yang Yongwen	Japan	University of Kitakyushu	2004.9-2009.3	Study for a doctorate
12	Wu Qiong	Japan	University of Kitakyushu	2012-2015	Study for a doctorate

Table 5-4 List of double-professionally-titled teachers

Name	Gender	Age	Academic degree and diploma	Job title	Graduate major	Professional work experience (engineering practice background)
Liu Fang (double-professionally-titled teacher)	Female	46	Doctoral candidate	Professor	Power Engineering and Engineering Thermophysics	Research Engineer, American Building Energy Corporation
Zheng Puyan (double-professionally-titled teacher)	Female	48	Doctoral candidate	Associate professor	Thermal engineering	Industry-university-research cooperation for 1 year in Xi'an Thermal Power Research Institute Co., Ltd.
Li Yan (double-profes	Female	42	Postdoctor	Associate professor	Thermal engineering	Industry-university-research

sionally-titled teacher)						cooperation for 2 years in Shanghai Waigaoqiao Third Power Generation Co., Ltd.
Li Fangqin (double-profes sionally-titled teacher)	Female	44	Doctoral candidate	Associate professor	Thermal engineering	Industry-university -research cooperation for half a year in Shanghai Waigaoqiao First Power Generation Co., Ltd.
Cheng Zhihai (double-profes sionally-titled teacher)	Male	44	Doctoral candidate	Associate professor	Thermal engineering	Shanghai Power Equipment Design and Research Institute; Shanxi Sunshine Power Co., Ltd.
Liu Jianquan (double-profes sionally-titled teacher)	Male	50	Doctoral candidate	Associate professor	Nuclear power engineering	China General Nuclear Power Group
Weng Jianhua (double-profes sionally-titled teacher)	Male	52	Doctoral candidate	Associate professor	Engineering Thermophysics major	Shanghai Power Equipment Design and Research Institute
Wang Du (double-profes sionally-titled teacher)	Male	40	Doctoral student	Associate professor	Thermal engineering	Industry-university -research cooperation for 2 years in Shanghai Waigaoqiao Third Power Generation Co., Ltd.
Liu Jiang (double-profes sionally-titled teacher)	Male	40	Doctoral candidate	Lecturer	Power Engineering and Engineering Thermophysics	Shanghai Waigaoqiao Second Power Generation Co., Ltd.
Lu Jianfeng (double-profes sionally-titled teacher)	Male	57	Bachelor degree	Lecturer	Thermal Energy and Power Engineering	Huaneng Shidongkou Power Plant
Liu Hailong (double-profes	Male	33	Master student	Assistant engineer	Thermal Energy and	Shanghai Power Equipment Design

sionally-titled teacher)					Power Engineering	and Research Institute
Yan Ting (double-profes sionally-titled teacher)	Male	39	Doctoral candidate	Lecturer	Thermal Energy and Power Engineering	Industry-university -research cooperation for 2 years in Shanghai Waigaoqiao Third Power Generation Co., Ltd.
Ying Yulong (double-profes sionally-titled teacher)	Male	33	Doctoral candidate	Lecturer	Marine engineering	Shanghai Electric Power Group R&D Center
Jiang Weiting (double-profes sionally-titled teacher)	Male	41	Doctoral candidate	Associate professor	Thermal engineering	Industry-university -research cooperation for 1 year in Shanghai Fuhua Xinke Information Technology Co., Ltd.
Zhang Tao (double-profes sionally-titled teacher)	Male	34	Doctoral candidate	Lecturer	Power Engineering and Engineering Thermophysics	Industry-university -research cooperation for 1 year in Shanghai Waigaoqiao Third Power Generation Co., Ltd.
Yang Yongwen (double-profes sionally-titled teacher)	Male	39	Doctoral candidate	Lecturer	Power Engineering and Engineering Thermophysics	Industry-university -research cooperation for 1 year in Shanghai Fuhua Xinke Information Technology Co., Ltd.
Wang Wenhuan (double-profes sionally-titled teacher)	Female	41	Master student	Engineer	Thermal engineering	East China Electric Power Testing Institute

5.2.2 Relevant capital

The university provides professional teachers with multi-level and various forms of capital support to improve their professional academic research and teaching capabilities.

Shanghai Municipal Education Commission and the university provide capital for professionals to study abroad. The amount of subsidy is RMB130,000 per person per year, and 3-5 teachers in each program will receive subsidies.

In order to promote professional teachers to combine theory with practice, the university encourages young and middle-aged employees to regularly practice in relevant enterprises or scientific research institutions. The amount of subsidy is RMB30,000 per person per year, and 3-5 teachers in each program will receive subsidies.

Shanghai Municipal Government has launched the "Shanghai University Young Teacher Training Subsidy Program" to subsidize outstanding young teachers with doctoral degrees and master's degrees to carry out scientific research activities. The amount of subsidy is RMB50,000 per item.

5.3 Institutional environment, financial and material resources

5.3.1 About Shanghai University of Electric Power

The university was founded in 1951 and has long been under the management of the national electric power department. In 2000, it was under localized management. The university has gone through the development and evolution from Shanghai Electric Industry School, Shanghai Power School, Shanghai Electric Power School, Shanghai Electric Power College, to Shanghai College of Electric Power. It started to run at undergraduate level in 1985, and at master level in 2006. In 2018, it became a doctorate granting unit. Since then, the university has formed a complete degree authorization system for bachelor, master and doctor. In 2018, with the approval of the Ministry of Education, it was renamed to Shanghai University of Electric Power. In 2019, our university was approved as a pilot unit for the construction of high-level local application-oriented university in Shanghai, which supported our university to focus on such three majors as clean and safe power generation, smart grid, and smart energy management with energy and power as our feature, and to carry out pilot for construction of high-level local application-oriented university as a whole.

The university currently has more than 1,100 faculty members, including more than 790 full-time teachers. Among full-time teachers, those with a doctorate degree account for 51.26%. At present, 1 person has been selected into the National New Century Talents Project, 1 person selected into National Science Fund for Distinguished Young Scholars, 1 person selected as National Outstanding Teacher, 1 person awarded the title of National Outstanding Backbone Teacher; 2 persons selected as National Thousand Young Talents, 1 person selected into Ministry of Education Outstanding Talent Award Program, 3 persons selected into New Century Excellent Talents in University; 1 person selected into "Thousand Talents Program" in Shanghai, 1 person selected as Shanghai Leading Talent, 1 person selected as Shanghai Outstanding Subject Leader, 3 persons selected as Shanghai Famous Teacher, and 14 persons selected as Shanghai "Oriental "Scholars" ("Young Oriental Scholars") distinguished professors. In addition, 7 people enjoy

special government allowances, 10 people have won Shanghai Baosteel Outstanding Teachers Award, and 28 people have won Shanghai Award for Bringing up Talents.

The university has 13 secondary schools such as School of Energy and Mechanical Engineering, School of Environment and Chemical Engineering, School of Electrical Engineering, School of Automation Engineering, School of Computer Science and Technology, School of Electronics and Information Engineering, School of Economics and Management, School of Mathematics and Science, School of Foreign Languages, School of International Exchange, School of Continuing Education (including Shanghai New Energy Talent Technology Education Exchange Center), the School of Marxism, and the Department of Sports, as well as 32 undergraduate majors.

The university has 3 national characteristic majors, 1 pilot major for comprehensive professional reform under the Ministry of Education, and 2 pilot majors for professional comprehensive reform in Shanghai. It has 1 Shanghai IV Peak Subject, 1 Plateau Subject, 1 Shanghai First-Class Subject, 6 Shanghai Key Subjects, and 5 Key Subjects under the Municipal Education Commission. At present, there are 6 first-level subjects such as power engineering and engineering thermophysics, electrical engineering, chemical engineering and technology, physics, information and communication engineering, control science and engineering, and 5 master degree granting sites such as power engineering, electrical engineering, control engineering, engineering management, and computer technology. The university can independently recruit and train master students. In 2018, the university was approved as a doctoral degree-granting unit, and our electrical engineering subject was approved as a doctoral degree granting subject.

With an excellent grade, the university passed the evaluation of undergraduate teaching level by the Ministry of Education in 2006. The university has won 2 National Teaching Achievement Awards. At the past two Shanghai Teaching Achievement Award Selections, it won 19 awards, including 1 special prize and 11 first prizes. Currently, there are 5 undergraduate and 2 master pilot majors. In 2017, the Electrical Engineering and Automation major was jointly certified by the Higher Education Teaching Evaluation Center of the Ministry of Education and the China Engineering Education Accreditation Association, indicating that the quality of this major has achieved international substantial equivalent and entered the "first phalanx" of global engineering education. In 2018, a project of our university was included in Shanghai "First-class Undergraduate" construction initiative, 9 majors were approved as "application-oriented undergraduate" pilot majors, and 2 majors were approved as "vocational school + applied undergraduate connection" pilot majors. The university has 32 Shanghai quality courses, 28 national planning textbooks and Shanghai excellent textbooks, and 4 Shanghai teaching teams. The university has 2 national practice (experiment) bases (centers), 3 provincial and ministerial experimental demonstration bases (centers), 5 provincial and ministerial off-campus internship (practice) bases, and more than 100 off-campus internship bases. In 2018, the university accepted the review and evaluation of undergraduate teaching work by the Ministry of Education.

5.3.2 About School of Energy and Mechanical Engineering

In Shanghai University of Electric Power, Energy and Power Engineering is the major with the longest history and the most distinctive feature of power production industry. It has a history of 68 years and has trained more than 20,000 talents for power industry of our country. Energy and Power Engineering is a national characteristic major recognized by the Ministry of Education and a backbone major funded by the "Central Finance Supported Local University Development Program". In 2012, it was selected into the first batch of "Professional Comprehensive Reform Pilot Majors" by the Ministry of Education. In 2016, it was selected as an “Application-oriented Undergraduate Pilot Major” in Shanghai, and in 2018, it entered the ranks of Shanghai “First-class Undergraduate” construction.

This major highlights industry characteristics and industry needs, and relies on electricity to serve the society. This major has distinct characteristics and advantages in terms of power generation operation technology. Among local universities in Shanghai, this major is the only major featuring clean, efficient and safe electric power production. It is closely integrated with the industry. According to the professional rankings announced by the Alumni Association, this major ranks among the top universities of the same type in Shanghai.

This major relies on distinctive features of power engineering and engineering thermophysics. The subject has first-level master's degree and professional degree granting site. The university has 1 Shanghai key (cultivation) subject, 2 key subjects selected by Shanghai Municipal Education Commission, 1 key laboratory at Ministry of Machine-Building Industry level, and 2 Shanghai engineering technology research centers.

This major has a number of high-quality technical foundations and professional courses. Professional core courses such as Boiler Principles, Steam Turbine Principles, and Thermal Power Plants, are all excellent courses of Shanghai. Professional basic courses such as Heat Transfer, Engineering Thermodynamics, and Engineering Fluid Mechanics are Shanghai excellent courses or key construction courses. Technical basic course Mechanics of Materials is also an excellent course of Shanghai. This major also actively explores MOOC, online and offline mixed courses, and ideological and political courses.

It has a practical teaching system of "school-enterprise co-construction, virtual and real combination" The university has large experimental teaching platforms such as 600MW steam turbine high and medium-pressure cylinder rotors, and has established a virtual simulation experiment center. The virtual simulation experiment center has a full range of virtual simulation platforms for supercritical units, circulating fluidized bed units, gas-steam combined cycle units, and virtual simulation software for power plant desulfurization systems and new energy power generation. The practical teaching method with virtual and real combination enables students to master large-scale thermal power unit operation and operation capabilities, basic unit failure analysis and processing capabilities, production organization and technical management capabilities.In the recent selection of the Shanghai Teaching Achievement Award, 2 first prizes were won. See Appendix h.

Serve the "Belt and Road" initiative and train international energy and power talents. Relying on the "Belt and Road" energy and power university alliance, explore the new model of "Belt and

Road" energy and power talent training, and obtain the first batch of "new engineering" research and practice projects from the Ministry of Education. As the mainstay major of energy and power, it has laid a solid foundation for talent training for the university's building of a "Belt and Road" energy and power bridgehead.

Table 5-5 Development of School of Energy and Power Engineering and relevant projects

Year	Important symbol of the development of the School and relevant majors
1985	The Department of Thermal Energy and Power Engineering was established; undergraduate enrollment began.
2006	Approved for a master's degree for secondary subject of thermal energy engineering
2009	Selected as a national characteristic major under the Ministry of Education
2010	Approved for a master's degree for primary subject of power engineering and engineering thermophysics
2013	Approved as a national engineering practice education center
2014	Approved for a master's degree for power engineering major and selected as a pilot major for comprehensive reform of the Ministry of Education
2016	Approved as an applied undergraduate pilot major in Shanghai universities
2018	As a mainstay major, Energy and Power Engineering was selected in the leading program of first-class undergraduate construction by Shanghai colleges and universities
2019	Selected as a first-class undergraduate major in Shanghai

5.3.3 Professional laboratory

Laboratory management organization: The Laboratory and the Asset Management Department of Shanghai University of Electric Power are administrative organizations directly led by the university. Under the direct leadership of the person in charge, the department is responsible for the planning and construction of all laboratories, the teaching, as well as the purchase and operation management of research equipment of Shanghai University of Electric Power.

Laboratory safety management: The university attaches great importance to laboratory safety and has adopted a series of measures to enhance the laboratory safety awareness of all employees and students of the university.

On the basis of the *Laboratory Work Regulations of Colleges and Universities*, the university has formulated safety operation specifications for various professional laboratories, including: *Shanghai University of Electric Power Emergency Response Plan for Hazardous Chemical*

Accidents, *Shanghai University of Electric Power Emergency Response Plan for Laboratory Safety Accidents*, *Shanghai University of Electric Power Measures for Opening Laboratories to Undergraduate Students*, *Shanghai University of Electric Power Laboratory Safety Accountability Measures (Trial)*, *Shanghai University of Electric Power Safety Supervision and Management Measures for Hazardous Chemicals*, *Shanghai University of Electric Power Laboratory Management Regulations*, *Shanghai University of Electric Power Laboratory Safety and Health Inspection Regulations*, *Shanghai University of Electric Power Laboratory Safety Management Measures*, *Shanghai University of Electric Power Laboratory Work Regulations*, *Shanghai University of Electric Power Laboratory Safety Access Regulations (Trial)*.

Laboratory safety education: Before entering relevant laboratory, students must complete laboratory safety education training and testing. Students who fail the safety test are not allowed to enter relevant laboratory.

For more information about laboratories, please refer to Appendix G.

1) General laboratory

- Engineering Thermophysics Laboratory

Forced convection heat release coefficient measurement experiment, hot wire wind speed measurement experiment, heat exchanger integrated experiment, flat surface layer velocity distribution experiment, nozzle experiment, thermal conductivity measurement, blackness experiment, saturated steam experiment, normal radiation test, etc.

- Fluid Mechanics Laboratory

Along-path resistance experiment, self-circulation along-path resistance experiment, self-circulation momentum experiment, self-circulation energy equation experiment, self-circulation Reynolds experiment, self-circulation local resistance experiment, comprehensive experiment on self-circulation water hammer, self-circulation flow demonstration experiment.

- Electrician Measurement and Control Laboratory

Single-phase half-wave controlled rectification experiment, three-phase half-wave rectification and active inverter experiment, DC chopper circuit performance research experiment, AC voltage regulator circuit experiment, DC chopper circuit performance research experiment, single-phase half-wave rectification circuit experiment.

- Computing Network Laboratory

Computer network experiment, basic data type and input and output experiment, sequence structure programming experiment, selection structure programming experiment, loop control experiment, array experiment, function experiment, structure experiment, pointer experiment.

- University Physics Laboratory

The measurement of Young's elastic modulus, the use of a multimeter, the use of a Wheatstone bridge to measure resistance, the use of a potentiometer to measure the electromotive force of the battery, the depiction of the electrostatic field, the adjustment of a spectrometer, the measurement of the vertex angle of a prism, the use of an oscilloscope and the measurement of natural frequency of tuning fork, measurement of gravitational acceleration by pulse signal method, standing wave, forced vibration experiment, Hall effect, measurement of thin lens focal length, electric meter modification experiment, measurement of Newton ring curvature radius, hysteresis return of ferromagnetic materials, and basic magnetization curve, the relationship between PN forward pressure drop and temperature.

2) Professional laboratory

- Boiler Principle Laboratory

Superheater flow deviation experiment, flame propagation speed measurement experiment, hot water boiler heat balance experiment

- Pump and Fan Performance Test Laboratory

Water pump series and parallel performance test experiment, cavitation experiment, fan performance test experiment, Pitot tube wind speed measurement experiment, centrifugal pump frequency conversion and energy saving experiment, fan frequency conversion and energy saving experiment, wind power demonstration experiment

- Steam Turbine Principle Laboratory

Blade vibration frequency measurement experiment, eddy current flaw detection experiment

- Open Laboratory

Rankine cycle thermal power generation integrated experiment, flame propagation characteristics integrated experiment, heat transfer integrated experiment

- Refrigeration Principle Laboratory

Refrigeration compressor performance test experiment

- Large-scale Thermal Power Unit Simulation Laboratory

Factory-wide three-dimensional digital roaming experiment, simulation practice, digital disassembly and maintenance experiment

5.3.4 Subject research platform

The School of Energy and Mechanical Engineering has 3 institutes: Institute of Energy and Power Engineering, Institute of New Energy and Engineering Thermophysics, and Institute of Intelligent Manufacturing.

The major includes key subjects in Shanghai including power plant thermal power and environmental engineering, power plant clean production and energy-saving engineering, power plant clean power production and green energy utilization, as well as provincial and ministerial key laboratories or research centers including the key laboratory of clean power generation and environmental protection technology in the machinery industry, and the energy-saving project and technology research center of Shanghai heat exchange system, and Shanghai Power Generation and Environmental Protection Engineering Technology Research Center.

- The School of Energy and Mechanical Engineering has the following degree-granting majors:
  - A first-level subject master's degree granting major: power engineering and engineering thermophysics
  - Two professional master's degree granting majors: energy and power (power engineering), mechanical engineering
  - Five undergraduate courses (bachelor's degree): Energy and Power Engineering, New Energy Science and Engineering, Mechanical Design and Manufacturing and Automation, Mechatronic Engineering, Nuclear Engineering and Nuclear Technology
- Research facilities of the School of Energy and Mechanical Engineering

The main research facilities include wind tunnel test platform, transcritical CO2 heat pump energy storage system test platform, comprehensive heat transfer performance test platform, flue gas treatment test platform, clean combustion test platform, photocatalytic test platform, solar photovoltaic power generation test platform, heat pipe/pump composite system optimization test platform.

- Wind tunnel test platform: wind tunnel, open test section, closed test section, differential pressure transmitter, hot wire anemometer, frequency converter, console, servo drive, servo motor, digital display, motion control card, programmable controller；
- Flue gas processing test platform: mercury analyzer, infrared multi-component gas analyzer, flue gas analyzer, temperature programmed chemical adsorption system, automatic mercury analyzer, mercury vapor generator, gas chromatograph, coal-fired flue gas elemental mercury meter, portable sampler, gas mass flow controller;
- Clean combustion experiment platform: ceramic fiber muffle furnace, electric thermostatic blast air oven, xenon light source, desktop high-speed centrifuge, tube furnace, ultrasonic dispersion instrument, vacuum oven;
- Comprehensive heat transfer performance experiment platform: high temperature furnace, thermogravimetric analyzer, thermal infrared imager, combustion experiment platform, burner, fast burning coal analyzer, carbon flue gas analyzer, CHO tester, sulfur analyzer, ion chromatography analyzer, gas chromatograph, nanometer performance measurement and control system;
- Photocatalytic test platform: ultrasonic dispersion instrument, ultrasonic cleaning machine, Fourier infrared transform spectrometer, automatic gas adsorption analyzer, chemical adsorption analyzer, gas chromatography;
- Steam power equipment, gas turbine experiment platform, gas turbine, gas turbine combustor, gas turbine power meter;

- Solar photovoltaic power generation experiment platform: solar generator test bench, DC inverter compressor, temperature and humidity sensor, PVT collector, solar pyrometer;

● Main research directions of energy and power engineering

- Clean and efficient power generation of thermal power units

Research content includes: collaborative removal of multiple pollutants (SOx, NOx, PM, Hg, etc.), high-efficiency SCR and heavy metal catalyst removal technology, unit flexibility transformation and operation technology, overall unit efficiency and energy saving technology under wide load, and other energy saving technologies.

- New energy utilization and energy storage technology

Research content includes: solar photovoltaic and thermal power generation and cogeneration, wind power plant layout and key wind turbine technology, phase change and chemical heat storage technology, wind/photovoltaic/storage technology and new energy and thermal power "bundled" power generation technology.

- Multi-energy complementary integrated smart energy system

Research content includes: regional integrated energy system planning, design and operation optimization; new high-density distributed heat storage and advanced power cycle power generation technology; integrated cascade utilization of energy and multi-energy coupling power generation technology and system, integrated energy system market-oriented trading mechanism and business mode.

- Carbon dioxide capture and resource utilization

Research content includes: new high-efficiency CO2 physical capture technology, new high-efficiency CO2 chemical capture technology, new high-efficiency CO2 biological capture technology, high-efficiency CO2 photocatalytic conversion energy technology.

- Solid waste fuel utilization

Research content includes: urban sludge and coal-fired coupling power generation technology, waste tires and coal-fired coupling power generation technology, biomass and garbage and coal-fired coupling power generation technology, biomass and other solid waste gasification technology.

- Nuclear power reactor thermal engineering and hydrogen energy utilization

Research content includes: reactor thermal-hydraulic program development and equipment reliability, physical and thermal processes of integrated small reactor, hydrogen fuel cell performance optimization and membrane technology, design and parameter optimization of fuel cell high-performance stack.

5.3.5 International exchange and cooperation platform

Establish a collaborative education platform for universities at home and abroad. On the basis of the International Academic Forum for the Development of Electric Power Technologies (ADEPT), we have initiated the establishment of the "Belt and Road" Energy and Electricity University Alliance (RAEP) and the "Belt and Road Energy and Power Industry, Education and Research Alliance (CEIU)" to further promote regional university alliances to carry out talent training. We have established a talent cooperation training mechanism, and signed cooperation agreements or memorandums with universities and institutions such as Strathclyde University, Hanoi University of Industry, Suranaree University of Technology, Vietnam University of Electric Power, and Curtin University. We have built the “Belt and Road” countries' student joint-training model, and negotiated on the “2+2” training model for international students, realizing mutual recognition of credits in principle. In addition, we have strengthened cooperation and exchanges with universities in “Belt and Road” countries, and we accept foreign college students for exchanges. We serve the “Belt and Road” countries' energy and power companies. Five teachers of this major, including Professor Qiu Zhongzhu, Professor Wu Jiang, and Associate Professor He Ping, have completed training on the engineers and technicians of power companies in China and "Belt and Road" countries in English. The training courses include Principle of Boiler, Principle of Steam Turbine, Centralized Control Operation of Units, etc.

Students of energy and power engineering major actively participate in overseas study, internships, international exchanges and other activities. In July 2018, the university signed a tripartite cooperation memorandum with Batangas State University and Shanghai Power Construction, confirming that the three parties would conduct comprehensive cooperation in industry, university and research. In March 2019, the teachers and students of this major were sent to form a cooperative team with the students from Batangas State University, which was then dispatched for internship of 3 months at the overseas GNPD project site of Shanghai Electric Power Construction Engineering Co., Ltd. in the Philippines. In May 2019, the first "Belt and Road" overseas internship base of the university was built, providing strong guarantee for students to practice internships in overseas energy and power companies.

We have established a mechanism for selecting energy and power engineering students for overseas study, internship and international exchange, as shown in Table 11.

Table 11 Overseas exchanges of students from pilot majors

Name	Major	Time to go abroad	Time to return	Place	Unit
Ge Ting	Energy and Power Engineering	2015.07	2016.08	United States	McMurry University
Zhao Xuying	Energy and Power Engineering	2015.9	2016.6	Germany	Brandenburg Technology University
Yu Yangmin	Energy and Power	2015.9	2016.6	Germany	Brandenburg Technology University

	Engineering				
Gao Kunfeng	Energy and Power Engineering	2016.01	2016.12	Australia	Edith Cowan University
Zheng Yiyun	Energy and Power Engineering	2016.07	2016.08	Canada	University of Victoria
Gao Yuqi	Energy and Power Engineering	2016.07	2016.08	United States	McMurry University
Kang Haoyu	Energy and Power Engineering	2017.07	2017.08	Canada	University of Victoria
Song Weiyi	Energy and Power Engineering	2017.07	2017.08	United States	West Virginia University
Zhang Yijun	Energy and Power Engineering	2017.09	2018.01	Australia	Edith Cowan University
Gu Minglei	Energy and Power Engineering	2017.09	2018.09	UK	University of Strathclyde
Li Qi	Energy and Power Engineering	2018.09	2019.09	UK	University of Strathclyde
Sun Zihan	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Mao Xinyi	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Jiang Zipei	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Meng Liangchen	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Pan Hongwei	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Ruan Yuanxu	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu

Huo Longxiang	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Jiang Zihan	Energy and Power Engineering	2018.08	2018.08	Japan	University of Kitakyushu
Qiu Yucheng	Energy and Power Engineering	2019.3	2019.6	Philippines	Batangas State University Shanghai Power Construction GNPD Project Base
Yang Jihao	Energy and Power Engineering	2019.3	2019.6	Philippines	Batangas State University Shanghai Power Construction GNPD Project Base

5.3.6 Enterprise practice platform

The Energy and Power Engineering major attaches great importance to the role of enterprise practice platforms in talent training, and has built a long-term mechanism for school-enterprise joint training of talents, including organizational systems and long-term operating mechanisms. Cooperative companies are all those companies with industry backgrounds that are closely aligned with Energy and Power Engineering major, such as: electric power production companies and maintenance companies, including Zhejiang Zheneng Jiaxing Power Generation Co., Ltd., Shanghai Waigaoqiao Third Power Plant, Huaneng Shidongkou Maintenance Company, etc.; power equipment manufacturing and installation companies, including Shanghai Boiler Factory, Shanghai Turbine Factory, etc.; and enterprises and research institutes with certain power scientific research or power engineering design capabilities, including Shanghai Electric Power Co., Ltd., East China Electric Power Testing and Research Institute, East China Electric Power Design Institute, East China Electric Power Training Center, Suzhou Thermal Power Research Institute, and Guangzhou Energy Institute, as well as other power-related technology research and development companies.

Through a long-term operation mechanism, the Energy and Power Engineering major has established the "National Engineering Practice Education Center" jointly with Zhejiang Zheneng Jiaxing Power Generation Co., Ltd., the "Power Industry Simulation Training Base (thermal power)" jointly with China Electric Power Enterprise Federation, and the "Electric Power Talents' Vocational Development Education Off-campus Practice Base" jointly with Shanghai Waigaoqiao Third Power Plant, which are all very successful cases, laying a solid foundation for the cultivation of practical ability of talents in Energy and Power Engineering major and other relevant majors.

5.3.7 Library information resource platform

The library of Shanghai University of Electric Power was founded in 1951. After more than 60 years of historical vicissitudes and cultural accumulation, it has formed a resource system with engineering as the mainstay and management, science, economics, literature and other subjects as the supplement, with obvious power and electric characteristics, combining traditional collection of books and digital information. As of December 31, 2018, the accumulated paper collection has reached 1.323 million volumes, the average annual number of new books bought exceeds 3 volumes per student, and more than 1,200 paper journals have been subscribed; the library has

6.899 million volumes of e-books, dissertations, etc., and 27 digital resource databases.

The management of our library adopts the Huiwen Document Information Service System. The data entry of all collections of books and periodicals has been basically completed, and a complete set of automated management covering procurement, cataloging, collection, circulation, periodicals, administrative management, and reader inquiry system has been realized. Since 2011, RFID technology has been adopted to facilitate readers' inquiries and borrowing, realizing service functions such as book self-borrowing, collection inventory, and query positioning, and improving the level of intelligent and networked management.

The current library of Shanghai University of Electric Power consists of two zones and three libraries, with a total floor area of about 29,200 square meters. The library currently has 39 full-time employees, of whom 69.2% have intermediate and senior titles, and 76.9% are undergraduates and graduate students. There are 2517 seats for readers, including 2305 seats for integrated study and reading and 212 seats for self-study. The university attaches great importance to the construction of the library and continues to increase investment in the library. In recent years, the purchase cost of books and literature resources has increased year by year. Since 2012, we have newly purchased Science Direct (Elsevier), Web of Science (SCI, ISTP (CPCI)), Engineering Village (EI), ASME, ACS, NPC photocopying materials and other Chinese and foreign databases. The purchase structure of digital resources, paper periodicals, and Chinese and foreign paper resources has been continuously optimized.

5.3.8 Teaching and office facilities

The School of Energy and Power Engineering has four dedicated experimental/teaching and office buildings distributed in two campuses, with Lingang campus as the mainstay, with a total area of more than 20,000 square meters, which can meet teaching, scientific research, foreign exchanges and cooperation, and teachers’ office space needs.

Please refer to Appendix Q for information on teacher office space.

5.3.9 Other external cooperation

The School of Energy and Mechanical Engineering has many teachers who have studied abroad and have received overseas training. In addition, it has established close ties and cooperation with the University of Kentucky, the National Renewable Energy Laboratory, Purdue University, the University of Nottingham, Waseda University, University of Kitakyushu, Hong Kong Polytechnic University, and other overseas universities. In addition, the School has established undergraduate exchange programs with many universities in Germany, the United States, and Japan, and has sent many undergraduate and graduate students to study abroad, laying a good foundation for international cooperation.

5.3.10 Investment in the last three years

This major has sufficient teaching funds to meet daily teaching needs and development of this major. In the past three years, nearly RMB30 million has been invested in laboratory construction, and more than RMB5 million has been invested in course construction and university student innovation projects.

In the past three years, funds for scientific research and equipment purchases for energy and

power engineering subjects have increased year by year. In 2019, the research capital for Energy and Power Engineering major reached more than RMB6 million, and the research capital of the university that year reached RMB200 million. The School has established a scientific research team, and its members can enjoy performance allowances if the year-end assessment meets the requirements.

Please refer to Appendix F for the capital investment of large-scale equipment in the last three years.

6. Quality Management: Further Development of Degree Courses

6.1 Quality assurance and further development

6.1.1 Internal teaching quality evaluation

6.1.1.1 University-level teaching quality evaluation

In each semester, the university will conduct initial, mid-term and final teaching inspections. The inspection contents mainly include: lesson plan, lesson notes, classroom teaching, student learning effects, examination papers, and bachelor thesis process inspections, etc., in order to find solutions in time to the problems that may arise in the management process. Take examination paper inspection as an example. Each semester at Shanghai University of Electric Power, the examination papers of the previous semester will be randomly checked and evaluated from three aspects such as examination paper scores, examination paper analysis and improvement measures, so as to promote the rationalization and standardization of examination papers. Take teaching inspection as an example. In each semester, the teaching supervisor from the university's academic affairs office will walk into the classroom and listen to lectures. After class, the teaching supervisor will make suggestions to teachers on teaching methods and will evaluate the teachers' teaching performance from many aspects. In addition, teachers in the course group will listen to each other and exchange good experiences and practices. In each semester, the university will analyze the distribution of test scores for each course in the previous semester, the supervising teacher's scoring of the teacher, and the student's evaluation score of the teacher's teaching. Thus, suggestions and improvement requirements will be put forward to teachers for the purpose of improving teaching quality.

6.1.1.2 School-level teaching quality evaluation

(1) A professional teaching management system and management system have been established

The School has established a teaching steering committee to study and review major issues such as teaching development planning, teaching reform, training program revision, professional construction, course construction, and practice base construction, and clarified the basic requirements and standards of professional training programs, syllabus, teaching plans and other teaching links. In addition, the School has established a school teaching supervision committee to supervise and inspect the implementation of the training program, syllabus, graduation project, practical courses and the quality of classroom teaching of young teachers.

The School has formulated a clear teaching management system. The "Responsibilities of the Associate Dean for Teaching of the School of Energy and Mechanical Engineering" and the "Responsibilities of Faculty Staff of the School of Energy and Mechanical Engineering" have clarified the tasks and responsibilities of teaching management staff. A series of teaching management regulations such as the "School of Energy and Mechanical Engineering's Teaching Work Regulations", the "Graduation Project (Thesis) Work Regulations of School of Energy and

Mechanical Engineering", and the "Practice Teaching Requirements of School of Energy and Mechanical Engineering" regulate the teaching process of teachers and clarify teaching management process to ensure the quality of undergraduate teaching.

(2) A relatively complete teaching quality assurance system has been formed

The School has gradually improved the operation methods of information collection, analysis, feedback and rectification, and established an effective closed-loop teaching quality assurance operating mechanism through the "Teaching Survey Regulations of the School of Energy and Mechanical Engineering". Information feedback includes supervisory evaluation, leadership evaluation, peer evaluation, student evaluation and student feedback. Quality monitoring includes initial, mid-term, and final inspections and special inspections.

(3) Continue to strengthen the training of young teachers' professional teaching ability

The School continues to strengthen the training of young teachers' teaching ability, insists on the training of young teachers' teaching ability and supervision of teaching effects before job entry, before class and during classroom teaching. The School adheres to the "new and old teachers pairing" plan to promote the growth of young teachers. A lecture exchange competition among young teachers is held every year to provide a communication platform for young teachers to continuously improve their classroom teaching level and enhance their teaching ability.

6.1.2 External teaching quality evaluation

The university adopts an employer feedback system and listens to employers' suggestions. In addition, the university has also introduced external supervision. For example, this major has participated in the undergraduate teaching evaluation of colleges and universities initiated by the Ministry of Education and the excellent undergraduate course evaluation organized by the Shanghai Municipal Education Commission, which contributes to the formation of teaching quality. The evaluation mechanism involves the participation of higher authorities, employers, university, teachers and students, and combines internal and external evaluations. This major completed the construction of the "application-oriented undergraduate major pilot program" in 2019, and successfully passed the expert acceptance organized by the Shanghai Municipal Education Commission. Liberation Daily once reported on this and spoke highly of it. Please refer to Appendix S for details.

Energy and Power Engineering major has long been concerned about the career development of graduates after employment and the feedback from employers. Every year, MyCOS and Xinjincheng Data Technology Co., Ltd. are entrusted to conduct surveys on graduates, to understand the work performance evaluation of employers and the society on the students of this major, so as to continuously improve the quality of student training.

The employment situation of graduates: The employment rate of students in the 2015-2019 class has reached 97% or more, and the average salary upon graduation is about RMB5,000 respectively, and rises year by year. The rate of enrollment at home and abroad has increased from

7.6% to 11.3%. Domestic enrollment is mainly from Tongji University, Southeast University, Beihang University, Northwestern Polytechnical University, NNorth China Electric Power University, etc. Foreign enrollment is mainly from University of Pittsburgh, University of Washington, University of Sheffield, University of Manchester, Monash University, Technische Universität München, etc.

Alumni evaluation: According to the track survey of MyCOS Institute, the recommendation by Energy and Power Engineering major alumni reached 80%, alumni satisfaction reached 91%, teaching satisfaction reached 88%, and student job satisfaction reached 86%, all higher than the average level of the university.

Employer evaluation: The major job destinations of graduates of this major are state-owned enterprises, which are mainly five major power generation groups (Huaneng, Huadian, Datang, GD Power, China Power Investment), China General Nuclear Power and other large-scale central enterprises. The industries are concentrated in electricity, heat, gas, water production and supply industries. The positions are mainly engineering and technical personnel. Employers have a good overall impression of the graduates of this major, and believe that the graduates of our university have a strong dedication to work, a solid theoretical foundation, a sense of teamwork and strong self-learning ability. They base on first line and application. They are hard-working and curious, strong self-motivated, have strong ability to withstand pressure, and can complete tasks in a short time with quality and quantity guaranteed. They will strive to bring great profit and win honors for the enterprise.

6.2 Instruments, methods and data

6.2.1 Number of students and graduation rate

6.2.1.1 Energy and Power Engineering major

Table 6-1 lists the number of students and graduates of this major from 2015 to 2019. The destination of graduates is as shown in Table 6-1:

Table 6-1 Destination of graduates majoring in Energy and Power Engineering

Past five years	Number of students	Number of graduates with university diploma	Proportion of graduates with university diploma	Number /proportion of graduates who are employed (including domestic and overseas enrollment)	Number /proportion of graduates who continue their studies in China	Number /proportion of graduates going abroad for further studies	Number /proportion of graduates without a bachelor's degree
2015	163	159	97.55%	161/98.88%	11/6.75%	7/4.29%	10/6.13%
2016	159	151	94.97%	157/98.74%	9/5.66%	3/1.89%	13/8.18%

2017	214	212	99.07%	210/98.13%	17/7.94%	5/2.34%	11/5.14%
2018	153	148	96.73%	150/98.04%	10/6.54%	7/4.58%	10/6.54%
2019	162	146	90.12%	159/98.15%	23/14.20%	3/18.52%	20/12.35%

The university collects and analyzes data about graduates every year to evaluate the overall teaching implementation and teaching quality of the program.

6.2.2 Student assessment

Each student needs to earn 240 ECTS credits. Courses that students fail will be recorded. At the beginning of each semester, the university's examination committee will check each student's transcript. Those who fail the core course exam will not be able to start the new course. Those who pass the national CET-4 exam will be considered as qualified in the English course. Those who fail to earn 240 credits will not get a degree. For samples of student transcripts, please refer to appendices L1 and L2.

6.2.3 Exam score evaluation and continuous statistics

In accordance with the *Shanghai University of Electric Power Regulations on Undergraduate Student Status Management* and the requirements of students' professional training plan, the School has formulated the *Implementation Measures for Early Warning of Undergraduate Student Status Management of SUEP School of Energy and Mechanical Engineering* (see Appendix T). Analyze the learning situation of students in each semester, promptly warn students of possible or existing academic difficulties and problems, inform students and their parents of the possible adverse consequences, and take corresponding preventive and assistance measures in a targeted manner.

The School divides the student status warning into three levels: yellow, orange and red, as shown in Table 6-2.

Table 6-2 Early warning levels of School of Energy and Mechanical Engineering undergraduate student status management

Level	Situation
Yellow	10 credits ≤ the cumulative number of failed courses after re-examination of last semester's courses (refer to required courses, the same below) <20 credits
	The accumulated credits arrears before the graduation project of the senior year <5 credits
Orange	20 credits ≤ the cumulative number of failed courses after re-examination of last semester's courses <30 credits
	5 credits ≤ the accumulated credits arrears before the graduation project of the senior year <8 credits
Red	Number of failed courses after re-examination of last semester's courses ≥ 30 credits
	The accumulated credits arrears before the graduation project of the senior year ≥ 8 credits

Pre-warning of student status is carried out on a semester basis. Within 2 weeks after the

re-examination each semester, the faculty member of the School will analyze students' academic situation and provide relevant suggestions based on the analysis results, so as to improve students' learning effect. The list of students who need to be warned, their course grades, and their credit acquisition status (see Appendix U) will be summarized. The faculty member will transfer the list of students who need early warning and the summary table of early warning levels to the School's student working group. After checking and confirming the student information, the counselor will fill in the "School of Energy and Mechanical Engineering Notice on Early Warning of Undergraduate Student Status" and transmit it to relevant students and parents. For all students who are warned, a warning notice on student status will be sent to their parents. For students who reach red warning, their parents will be invited to the university if conditions permit, so as to have an interview with their parents on the study of the students. The counselor will talk to the students who are warned, help them analyze the reasons, re-correct their learning attitudes, enhance their learning initiative, and organize academic assistance for the students who are warned of their student status. Through repeated communication and multi-party cooperation of the university, students and parents, timely guidance and intervention, a joint force for educating people is formed, and the schoolwork is completed in accordance with the requirements of the university and the talent training goals of this major.

6.2.4 Students' evaluation on teaching quality

Students' evaluation on teaching quality is an important part of the teaching evaluation system. Each student must submit a teaching quality evaluation form before choosing a course each semester, otherwise he will not be able to choose a course for the new semester. The teaching suggestions listed in the form of evaluation will be evaluated and used to improve teaching methods. Student assessment will also be used to assess the quality of teachers’ teaching and be linked to teachers’ performance.

7. Document and Transparency

7.1 Relevant regulations

7.1.1 Teaching evaluation system

The Academic Affairs Office of Shanghai University of Electric Power regularly conducts internal teaching evaluations and carries out questionnaire surveys on students for each course, to understand the basic performance of teachers in all aspects of the teaching process. The questionnaires are collected and compiled by the Shanghai University of Electric Power Examination Committee, and then submitted to the dean of each school. The dean will notify relevant course teachers of the teaching evaluation results, and develop measures for the course teachers to continuously improve their teaching level and quality. For the evaluation questionnaire, please refer to Appendix I.

7.1.2 Student admission assessment

Since 2015, the admission score of Shanghai University of Electric Power has been higher than the admission score of national first-level undergraduates for national university entrance examination. Please refer to Appendix R for the admission criteria for Energy and Power Engineering major in the past five years.

Since 2015, Shanghai University of Electric Power (SHUEP) admission score has been higher than the national first-level undergraduate admission score for national university entrance examination. The admission criteria for Energy and Power Engineering major (EPE: Energy and Power Engineering) in the past five years are as follows:

7.1.3 Further development and continuous improvement

In order to meet job market demand and the development of professional technology, Shanghai University of Electric Power pays great attention to the continuous development of courses. After continuous exploration, the university has proposed relevant supporting management system. An information management platform for graduate follow-up information system and network management system has been established to collect and analyze the feedback information from employed graduates, realize the tracking and service of graduates, and at the same time strengthen the connection between graduates and students, support the continuous improvement of the talent training system. A system for student feedback and participation in professional construction has been created. In order to fully reflect the employment status of graduates and establish a long-term mechanism for the benign interaction between employment and talent training, the university has prepared and formally published an annual report on the employment quality of graduates according to the "Notice of the General Office of Ministry of Education on Compiling and Issuing the Annual Report on the Employment Quality of College Graduates" (J.X.T.H. [2013] No. 25), in conjunction with the scale and structure, employment rate, graduation destination, employment flow and other employment information statistics about the university's 2016-2018 graduates, as well as survey data from third-party data survey company

(New Jincin). In addition, the university will hold meetings during the annual celebration of the university anniversary and invite graduates to participate in the meeting to give feedback and suggestions. A platform for continuous exchanges and communication with graduates has been established to promote the continuous improvement of teaching plans and the improvement of teaching level and quality.

The School also pays great attention to the continuous development of courses. The Energy and Power Engineering major will invite industry experts and employers to participate in the curriculum system seminars of this major every year to develop courses that reflect social needs and the latest achievements of technological development. According to the actual development of the electric power and energy industries, the basic theory courses mainly elaborate on basic theories and basic knowledge of energy industry, with focus on teaching course-related concepts. The professional courses are set in a targeted manner based on the characteristics of energy industry. On the basis of keeping core courses relatively stable, timely adjust the settings of professional courses or relevant teaching content according to professional development and social needs, so as to promptly reflect the latest developments in the industry. The curriculum system is scientifically demonstrated based on visiting and investigating enterprise employers and similar domestic majors, as well as listening to relevant experts' opinions and suggestions.

7.2 Diploma supplements and qualification certificates

Appendix J and Appendix K provide samples of graduation certificates and bachelor's degree certificates for Energy and Power Engineering students. All diplomas are valid only after they are stamped with the official seal of the university and signed by the principal.