

05 Objectives & Learning Outcomes

abstract: This program is the curriculum for the Electrical Engineering and Automation major at Changchun Institute of Technology, designed to cultivate high-quality applied professionals with well-rounded development in moral, intellectual, physical, aesthetic, and labor education, all grounded in the power system. Through systematic study of mathematics, natural sciences, engineering fundamentals, and specialized courses, students will master core knowledge and skills in electrical engineering while developing strong practical abilities, innovative thinking, and an international perspective.

1.train objective

This program, rooted in power system engineering applications, cultivates high-caliber applied professionals with a well-rounded development in moral, intellectual, physical, aesthetic, and labor education. Graduates will possess solid theoretical foundations, strong practical skills, innovative capabilities, global perspectives, and social responsibility. They will be equipped to meet socioeconomic demands, excelling in power system engineering design, technological upgrades, installation and commissioning, operation and maintenance, repair and testing, information processing, project management, and market transactions. Through approximately five years of continuing education and engineering practice post-graduation, they will become technical and managerial pillars in the power industry. Specific competency indicators are as follows:

(1) Master the relevant guidelines, policies, laws, and regulations of the state and the power industry; possess a high level of ideological and political awareness and sound humanities and social science literacy; demonstrate a sense of social responsibility and professional engineering ethics; and develop comprehensive qualities that enable adaptation to socioeconomic development.

(2) Possess the ability to apply knowledge of mathematics, natural sciences, engineering fundamentals, specialized

expertise, as well as engineering-related fields such as safety, law, environment, economics, management, and marketing, utilizing modern tools to identify, formulate, analyze, and solve complex electrical engineering problems; be capable of designing and effectively implementing solutions to complex electrical engineering problems.

(3) Possess a strong sense of teamwork and coordination skills, with the ability to manage multidisciplinary projects within the constraints of law, ethics, society, environment, and economy.

(4) Demonstrate an international perspective as electrical engineers, capable of promptly understanding the current state of development in the field of electrical engineering both domestically and internationally, and able to communicate, exchange ideas, and collaborate effectively with professional peers and the public in cross-cultural contexts.

(5) Exhibit a spirit of innovation, be familiar with methods and approaches to innovation, and possess the capability to engage in research, development, and technological transformation of electrical systems, units, and devices.

(6) Have the capacity for lifelong learning, be able to proactively adapt to the development of the power industry, and continuously stay abreast of emerging technologies and new trends at the forefront of the discipline.

2.subject-specific criteria

The discipline-specific standards of electrical engineering and automation fully reflect the requirements of knowledge and understanding, interdisciplinary ability, engineering methodology, engineering development, engineering practice and product development.

Standard 1 (Engineering Knowledge): Master a solid foundation of mathematics, natural sciences, and engineering fundamentals; be able to apply knowledge of mathematics, natural sciences, engineering fundamentals, and specialized expertise to solve complex engineering problems in the field of electrical engineering; and understand the broader ethical and multidisciplinary context of the engineering field.

Standard 2 (Problem Analysis): Master methods for analyzing complex electrical engineering problems based on scientific

principles; be able to apply fundamental principles of mathematics, natural sciences, and engineering sciences to identify, assess, and articulate complex electrical engineering problems; and obtain valid conclusions through literature research and analysis.

Standard 3 (Design/Development of Solutions): Master the methods and related technologies of electrical engineering design; be able to design solutions for complex electrical engineering problems, taking into account factors such as society, health, safety, law, culture, and the environment; be capable of designing electrical systems, electrical units, and electrical devices tailored to specific needs; and demonstrate a spirit of innovation in the design process.

Standard 4 (Research): Be able to investigate complex electrical engineering problems based on scientific principles and employing scientific methods, through designing experiments, analyzing and interpreting data, and synthesizing information, to obtain reasonable and valid conclusions.

Standard 5 (Using modern tools): Be able to develop, select, and apply appropriate technologies, resources, modern engineering tools, and information technology tools for testing, analyzing, calculating, predicting, and simulating complex electrical engineering problems, while understanding their limitations.

Standard 6 (Engineering and Society): Be able to reasonably analyze and correctly evaluate the impact of professional engineering practices, such as electrical engineering design and implementation, on society, health, safety, law, and culture, based on the practical application scenarios of electrical engineering projects, and understand the responsibilities entailed.

Standard 7 (Environment and Sustainable Development): Be able to pay attention to, understand, and evaluate issues related to environmental protection, social harmony, and economic, ecological, and human sustainability in electrical engineering practices.

Standard 8 (Professional Standards): Possess humanities and social science literacy; understand the social responsibility of electrical engineers for public safety, health, welfare, and environmental protection; be able to consciously adhere to engineering professional ethics and norms in engineering practice; and fulfill social responsibilities.

Standard 9 (Individual and Team): Possess a strong sense of teamwork and collaborative spirit; be able to assume the roles

of individual, team member, or leader in multidisciplinary teams; and have the ability to respond to unforeseen events.

Standard 10 (Communication): Be able to draft official documents, engineering reports, and design manuscripts; be capable of communicating and exchanging effectively with peers in the power industry and the public regarding complex electrical engineering problems through oral presentations, written documents, diagrams, and other means; possess an international perspective in electrical engineering, master a foreign language, and be able to communicate fundamentally in cross-cultural contexts.

Standard 11 (Project Management): Understand and master the management and economic decision-making methods involved in electrical engineering projects, and be able to apply them in multidisciplinary environments.

Standard 12 (Lifelong Learning): Have an awareness of autonomous learning and lifelong learning; possess the ability to continuously learn and adapt to development; and be able to promptly stay informed about the latest theories, technologies, and international frontiers in electrical engineering.

3.Contact Hours and Credit Points

Minimum graduation requirement: 179 credits (ECTS Credit=230) ;

The minimum graduation requirement is 2122 contact hours.

The minimum graduation requirements for four-year undergraduate students are 179 credits (230 ECTS credits), comprising: 27 credits (27 ECTS credits)for Mathematics and Natural Sciences, 58 credits (80 ECTS credits)for Engineering and Related Disciplines, 46 credits (72 ECTS credits)for Engineering Practice and Graduation Design, 40 credits (43 ECTS credits)for Humanities and Social Sciences, and 8 credits for Extracurricular Quality Development. The total required credits for graduation are 165, with 14 credits allocated to electives (including 9 credits for university-wide general education electives).

4.system of education and degree

Standard academic system: Full-time undergraduate program with a standard duration of four years, and an extended duration of 3

to 6 years is permitted.

Degree: Bachelor of Engineering.

5.Core disciplines and curriculum system

5.1.Core disciplines

Electrical Engineering

5.2.main course

Advanced Mathematics, College English, Complex Functions, Signal Analysis and Processing, Electromagnetic Fields, Circuit Theory, Analog Electronics, Digital Electronics, Electrical Machinery, Power Electronics, Automatic Control Principles, Microcontroller Principles and Applications, PLC Principles and Applications, Power System Analysis, Power System Relay Protection, Power Plant Electrical Engineering, High Voltage Technology, etc.

5.3.Main Practical Sessions

Electrical circuit training, electronic process internship, power system simulation practice, integrated practice of power system relay protection, comprehensive power system experiment, professional orientation internship, power system analysis course design, power electronics technology course design, microcontroller application technology practice, PLC control system practice, power plant electrical engineering course design, high-voltage technology comprehensive experiment, power system relay protection course design, orientation internship, production internship, scientific writing and literature retrieval practice, electrical CAD application training, graduation project, etc.

6.The Relationship Matrix of Training Objectives,Subject Specific Standards and Curriculum System

6.1.Supporting the Training Objectives Matrix with Graduation Requirements

train objective Graduation requirements	target① Serve society	target② Professional Competence	target③ decision-making management	target④ international view	target⑤ Research Innovation	target⑥ autonomic learning
subject-specific criteria1		H				
subject-specific criteria2		H			H	
subject-specific criteria3		H			H	
subject-specific criteria4		H			H	
subject-specific criteria5		M			H	H
subject-specific criteria6	H					

index point pedagogical practices	Standard 1				Standard 2				Standard 3				Standard 4				Standard 5			Standard 6		Standard 7		Standard 8			Standard 9		Standard 10			Standard 11		Standard 12				
	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	10-3	11-1	11-2	12-1	12-2			
Mental Health Education for College Students																									H													
Learning to Dream																								H														
Big Data and Artificial Intelligence				H													H																					
College Students' Career Guidance and Career Planning																									H													
Party History (History of New China, Reform and Opening-up, and Socialist Development)																								H														
Entrepreneurship foundation																											H	H									M	
Innovative Methods and Practice																											H	H										
higher mathematics I	H																																					

index point pedagogical practices	Standard 1				Standard 2				Standard 3				Standard 4				Standard 5			Stand ard6		Stand ard7		Standard 8			Stand ard9		Standard 10			Stand ard11		Stand ard12			
	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	10-3	11-1	11-2	12-1	12-2		
linear algebra II	H																																				
Probability Theory and Mathematical Statistics I	H																																				
University Physics Experiment													H	H	H																						
college physics I	H																																				
complex variable function	H																																				
Introduction to Environmental Science																						H	H														
engineering drawing																																					
Fundamentals of Computer Programming (C Language)																	H	H																			
circuit theory	H	H												M	M	M																					

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	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	10-3	11-1	11-2	12-1	12-2		
analog electronic technology		H		M										M	M	M																					
digital electronic technology		H		M										M	M	M																					
electromagnetic field		H																																			
signal analysis and processing		H				H																															
Introduction to Electric Power Engineering																						H															
electromechanics					H	H	H								H																						
principle of automatic control		H	H	H										H	H	H																					
power electronic technology					H	H	H								H	H																					

index point pedagogical practices	Standard 1				Standard 2				Standard 3				Standard 4				Standard 5			Stand ard6		Stand ard7		Standard 8			Stand ard9		Standard 10			Stand ard11		Stand ard12			
	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	10-3	11-1	11-2	12-1	12-2		
Principle and Application of Single Chip Microcomputer					H		H							M	M	M																					
Principle and Application of PLC			H		H		H								H																						
power system analysis				H	H	H		H																										H			
power system relay protection					H	H		H																													
power plant electrical engineering									H	H	H	H																									
high voltage technique					H		H	H																						H							
electricity market																																		H	H		
Power Technology																																		H	H		
power system automation				H	H																																

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New Energy Power Generation and Comprehensive Utilization of Energy							H																															
Intelligent Microgrid Technology							H	H																														
Introduction to Energy Internet Technology																																						
Special Topic on New Technologies in Electrical Engineering																																						
teleoperation and dispatch automation					H										H		H																					
power system fault analysis					H			H																														

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Smart grid communication technology					H		H																																
Military skills																										H													
Basic Computer Practice in University																			H																				
Professional awareness internship																				H	H					H													
Circuit Training													H																										
Application of Matlab in Electrical Engineering Practice																			H	H																			
engineering training																	H																						
Electronic Technology Practice																	H																						

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Electrical Engineering in Power Plant																																							
Power Electronics Technology Course Design									H	H								H																			H		
Comprehensive Practice of Relay Protection in Power System													H		H	H	H																						
Professional English Practice																																						H	H
Electricity CAD Application Training																																							H
Power System Simulation Practice																	H	H	H																				

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	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	10-3	11-1	11-2	12-1	12-2	
integrated experiment of power system													H	H		H												H								
Training on Electric Power Safety Work Regulations																			H					H	H											
Electricity Production Practice																			H	H	H	H		H				H	H							
graduation project									H	H	H	H					H						M						H		H					H
Special Topic on New Technologies in Electrical Engineering																														H						
Practice of Scientific Writing and Literature Retrieval																													H							H
Writing and																													H		L					

index point pedagogical practices	Standard 1				Standard 2				Standard 3				Standard 4				Standard 5			Stand ard6		Stand ard7		Standard 8			Stand ard9		Standard 10			Stand ard11		Stand ard12			
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Communication																																					
Appreciation of Excellent Design Works																								M													
Labor Education and Practice																								M													
Innovation and entrepreneurship practice																											H	H									
social practice																									H											M	
club events, association activity																											H										

notes: In the table“H (high) ”、 “M (centre) ” “L (low) ”It indicates the relevance of the course to the graduation requirements.

7. Teaching Schedule

Course Category		Nature of the course	Course ID	course title	period			credit	Semester of the course	study independently	Europe	remarks
					total class hours	Theoretical class hours	Practical class hours				Total Credits	
General Education Courses in Humanities and Social Sciences (778 class hours, 40 credits)	Public Compulsory Course (644 class hours, 31 credits)	obligator y	my01031010	Ideological and Moral Education and the Rule of Law	48	40	8	3	1	42	3	
			my02051010	Essentials of Chinese Modern History	48	40	8	3	1	42	3	

			my03041 010	basic principles of Marxism	48	40	8	3	3	42	3	
			my04011 010	An Introduction to Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era	48	32	16	3	5	42	3	
			my04212 010	An Introduction to Mao Zedong Thought and the Theoretical System of Socialism with	48	40	8	3	4	42	3	

				Chinese Characteristics								
			my05011 011-8	situation and policy	64	56	8	2	1-8	0	2	
			wy01011 011-2	College English 1-2	128	128		8	1-2	112	8	
			ty010110 11-4	College Physical Education and Health 1-4	128	128		2	1-4	0	4	
			ty040110 10	military theory	36	36		1	1	0	1	
			xl010110 10	Mental Health Education for College Students	32	24	8	2	1	28	2	
			my03051	engineering	16	16		1	3	14	1	

			010	ethics								
			summation		644	580	64	31		364	33	
	University-wide General Education Elective Courses (134 class hours, 9 credits)	take as an elective course	my04031 020	Learning to Dream	16	16		1	1	14	1	mandatory
			jg052010 20	Big Data and Artificial Intelligence	16	10	6	1	2	14	1	mandatory
			my02031 020	Party's history	16	16		1	2	14	1	4 out of 1
			my02041 020	New History of China	16	16		1	2	14	1	
			my04051 020	History of Reform and Opening-up	16	16		1	2	14	1	
			my03031 020	History of Socialist Development	16	16		1	2	14	1	

			dq02281 021	College Students' Career Guidance and Career Planning I	18	18		0.5	2	12	1	mandato ry
			dq02281 022	College Students' Employment Guidance and Career Planning II	20	20		0.5	6	10	1	mandato ry
			sc010110 20	Entrepreneurshi p foundation	24	24		1.5	4	21	1.5	mandato ry
			sc010210 20	Innovative Methods and Practice	24	24		1.5	3	21	1.5	Limited selection

				General Quality Courses				2	1-8	60	2	
			summation		134	128	6	9.0		166	10.0	
Mathematics and Natural Science Courses (432 class hours, 27 credits)	Mathematics, Physics, Chemistry, Environment and Sustainable Development	obligatory	Ix010110 11-2	higher mathematics	160	160	0	10. 0	1-2	140	10.0	
			Ix020220 10	linear algebra II	40	40	0	2.5	2	35	2.5	
			Ix020320 10	Probability Theory and Mathematical Statistics I	48	48	0	3.0	3	42	3.0	
			Ix030220 10	University Physics Experiment II	32	0	32	2.0	2	28	2.0	
			Ix030110 11-2	college physics, university physics	96	96	0	6.0	2-3	84	6.0	
			Ix020420 10	complex variable	40	40	0	2.5	3	35	2.5	

				function								
			sh063210 10	Introduction to Environmental Science	16	16	0	1.0	1	14	1.0	
			summation		432	400	32	27		378	27	
Engineering Foundation Courses (336 class hours, 21 credits)	Add notes to core professional courses★	obligator y	jd012020 10	engineering drawing	40	40	0	2.5	2	35	2.5	
			jg050210 10	Fundamentals of Computer Programming (C Language)	48	24	24	3.0	2	42	3.0	
			dq01021 010	circuit theory	80	64	16	5.0	3	145	7.5	★
			dq01031	analog	56	46	10	3.5	4	94	5	

			010	electronic technology								
			dq01041 010	digital electronic technology	48	40	8	3.0	5	72	4	
			dq04191 010	signal analysis and processing	32	32	0	2.0	4	28	2	
			lx030320 10	electromagnetic field	32	32	0	2.0	4	58	3	
			summation		336	278	58	21		474	27	

Professional Foundation Courses (288 class hours, 18 credits)		obligator y	dq02101 010	Introduction to Electric Power Engineering	24	24	0	1.5	3	36	2	
			dq02014 010	electromechani cs	64	60	4	4.0	4	116	6	★
			dq03013 010	principle of automatic control	40	34	6	2.5	4	65	3.5	
			dq03051 010	Principle and Application of Single Chip Microcomputer	40	34	6	2.5	5	35	2.5	

			dq03035 010	power electronic technology	48	42	6	3.0	5	87	4.5	★
			dq02022 010	power system analysis	72	72	0	4.5	5	123	6.5	★
			summation		288	266	22	18		462	25	
Professional courses (152 class hours, 9.5 credits)		obligator y	dq02034 010	power system relay protection	56	56	0	3.5	6	109	5.5	★

			dq02062 010	power plant electrical engineering	48	48	0	3.0	6	87	4.5	★
			dq02042 010	high voltage technique	48	48	0	3.0	6	87	4.5	★
			summation		152	152	0	9.5		283	14.5	
Program Features (152 credit hours, 9.5 credits)	Professional Development Courses: Cross-disciplinary Courses (40 hours, 2.5 credits)	obligatory	dq02901 010	Power Technology, Economics and Management	24	24	0	1.5	6	36	2	

			dq02291 010	electricity market	16	16	0	1	5	29	1.5	
			summation		40	40	0	2.5		65	3.5	
	Professional Development Course (112 hours, 7 credits)	obligator y	dq03074 010	Principle and Application of PLC	32	26	6	2	5	58	3	
				summation		32	26	6	2		58	3
		take as an	dq02051 020	power system automation	24	24	0	1.5	6	36	2	

		elective course	dq02321 020	power system fault analysis	24	24	0	1.5	6	36	2	
			dq02331 020	Special Topic on New Technologies in Electrical Engineering	16	16	0	1	6	29	1.5	
			dq02341 020	New Energy Power Generation and Comprehensive Utilization of Energy	16	16	0	1	6	29	1.5	
			dq08042 020	Smart grid communication technology	16	16	0	1	6	29	1.5	

			dq08171 020	Intelligent Microgrid Technology	24	24	0	1.5	6	36	2	
			dq02351 020	Intelligent Microgrid Technology	16	16	0	1	6	29	1.5	
			dq08161 020	teleoperation and dispatching automation	24	24	0	1.5	6	36	2	
			dq02401 020	Introduction to Energy Internet Technology	16	16	0	1.0	6	29	1.5	
			summation		80	80	0	5		130	7	

			Course ID	Project Name	number of weeks	credit	Semester of the course			remarks
Engineering Practice and Graduation Project (Thesis) (46 credits)	Main Practical Teaching Components	obligatory	ty04601010	Military skills	3	1.0	1	0	4	
			jg04601010	Basic Computer Practice in University	1	1.0	2	25	1.5	
			dq02601010	Professional awareness internship	1	1.0	3	25	1.5	
			dq01621	Circuit Training	1	1.0	3	25	1.5	

			010							
			gx006110 10	engineering training	1	1.0	4	25	1.5	
			dq01611 010	Electronic Technology Practice	2	2.0	4	50	3	
			dq03602 010	Application Technology Practice of Single Chip Microcomputer	2	2.0	6	50	3	
			dq02621 010	Power System Analysis Course Design	2	2.0	5	58	3	

			dq03913 010	Power Electronics Technology Course Design	1	1.0	6	29	1.5	
			dq02631 010	Power Electronics Technology Course Design	1	1.0	7	29	1.5	
			dq03624 010	Practice of PLC Control System	2	2.0	7	50	3	
			dq02651 010	Power System Simulation Practice	2	2.0	7	50	3	

			dq02611 010	Course Design of Electrical Engineering in Power Plant	2	2.0	7	58	3	
			dq02761 010	Practice of English for Electrical Engineering	1	1.0	7	25	1.5	
			dq02731 010	Comprehensive Practice of Relay Protection in Power System	2	2.0	7	50	3	
			dq02712 010	integrated experiment of power system	1	1.0	7	25	1.5	
			dq02741 010	High Voltage Technology	1	1.0	7	25	1.5	

				Comprehensive Experiment						
			dq08661 010	Training on Electric Power Safety Work Regulations	1	1.0	7	25	1.5	
			dq02681 010	Electricity Production Practice	3	3.0	7	75	4.5	
			dq02801 010	Practice of Scientific Writing and Literature Retrieval	1	1.0	7	25	1.5	
			dq02751 010	Application of Matlab in Electrical Engineering Practice	1	1.0	7	25	1.5	

			jd018410 10	Electricity CAD Application Training	1	1.0	7	25	1.5	
			dq02692 010	graduation project	15	15. 0	8	450	23	
			summation		48	46.0		1224	72	
Second Classroom Quality Development (8 credits)	obligator y	Course ID	Project Name	Class hours or weeks	cre dit	Semest er of the course				remarks
		tw016010 10	social practice	16	1	1-8	14	1		
		xy016310 10	Labor Education and	32	1	5	0	1		

			Practice					
		sc016010 10	Innovation and Entrepreneurship Practice	32	2.0	1-8	28	2.0
		gj010210 10	Writing and Communication	16	1.0	2	14	1.0
		ys060210 10	Appreciation of Excellent Design Works	32	2.0	3	28	2.0
		tw016110 10	association activity	16	1.0	1-8	14	1.0
		summation		144	8		98	8
summation			2122 credit hours/48 weeks		179.0		3702	230.0

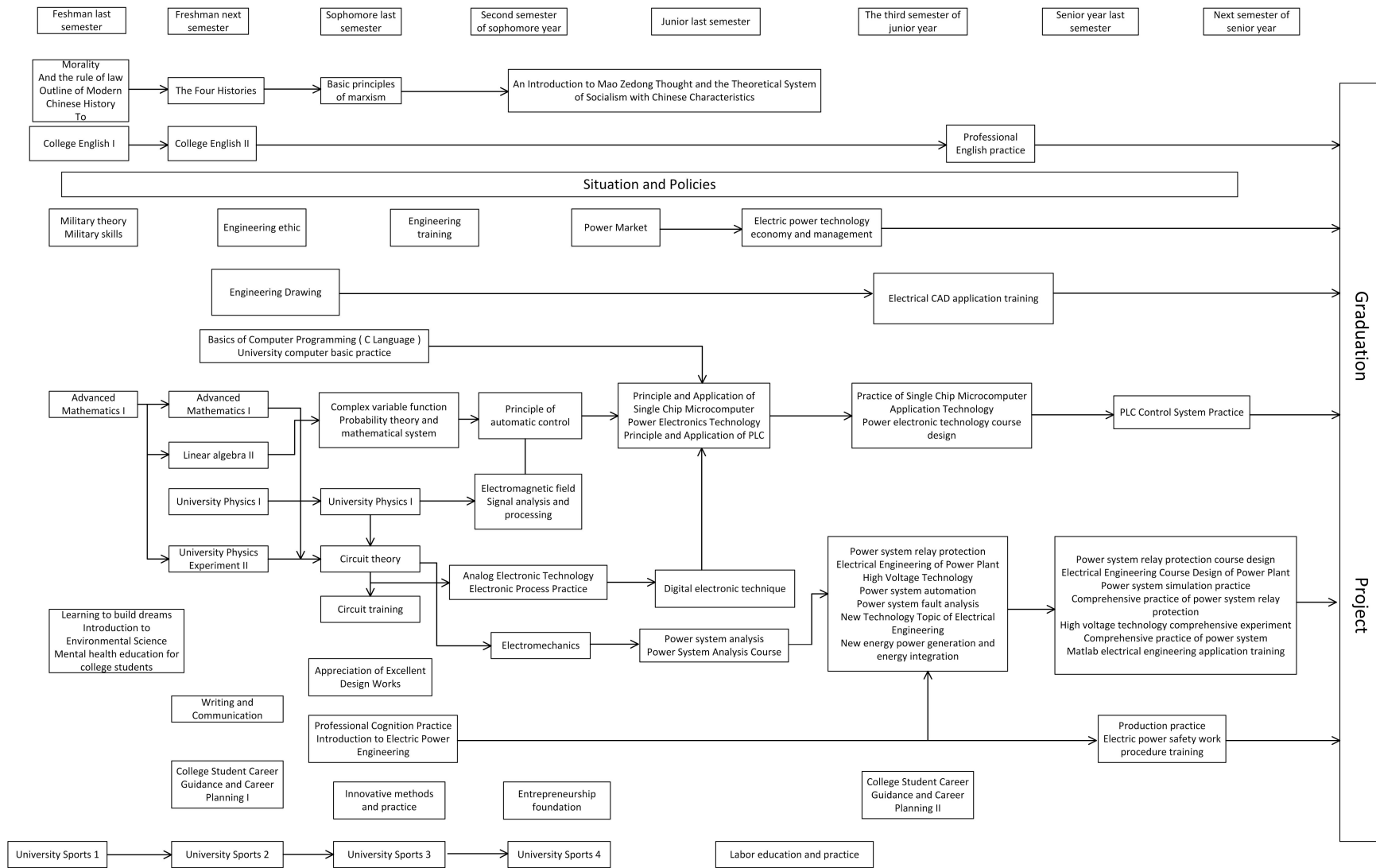


Fig.1 Teaching process diagram