

沈阳化工大学本科培养方案

机械与动力工程学院

专业名称：能源与动力工程

专业代码：080501

制 定：李雅侠

审 核：战洪仁

审 定：于三三

批 准：金志浩

2021 年 8 月

能源与动力工程专业培养方案

一、培养目标

本专业培养符合国家和区域发展需要，具有良好的人文素养、正确的社会主义核心价值观和扎实的专业知识，能够适应经济社会发展和行业科技进步，在热能工程、动力工程、制冷与空调工程、环境保护等领域从事技术开发、工艺和设备设计、安装、生产经营管理、教学与科学研究等工作，具有工程实践能力和创新意识的应用型技术人才和德智体美劳全面发展的社会主义事业合格建设者和可靠接班人。

专业对所培养的学生在毕业后 5 年左右的目标预期：

- （1）能够熟练运用数学、自然科学及能源动力工程基础和专业基础知识，具有综合考虑经济、环境、法律、安全等因素解决能源动力工程领域复杂的实际工程问题的能力，能够成为能源与动力工程领域的工程师和技术骨干；
- （2）在企业与社会环境下，借助现代工具，运用相关原理及工程设计基本理论，采用批判性思维分析、研究、开发能源转化与利用装置及系统；
- （3）具有强烈的社会责任感、良好的人文素养、职业操守和可持续发展理念；具备创新及团队合作意识，具有沟通、交流和工程项目管理能力；
- （4）适应现代化建设和社会发展需要，具备自主学习和终身学习能力、可持续发展理念和国际化视野，在专业发展方面表现出担当和进步，不断提升自身和职业发展能力。

二、专业方向

本专业不分方向

三、毕业要求

毕业能力要求及其指标点分解：

毕业能力要求	指标点
毕业要求 1： 工程知识：能够将数学、自然科学、工程基础和专业基础知识用于解决能源动力工程领域复杂工程问题。	1-1.掌握数学、物理、化学等自然科学知识,并能用于工程问题表述；
	1-2. 掌握相关工程基础知识,并能够针对具体工程问题建模并求解；
	1-3. 掌握必需的专业基础知识，能够对能源动力领域工程问题进行建模、推演、分析、研究；
	1-4 掌握必需的专业知识，并能够将其运用于能源动力工程领域复杂工程问题解决方案的比较和综合分析。
毕业要求 2： 问题分析：能够应用数学、自然科学和相关工程学科的基本原理，识别、表达并通过文献研究分析能源动力工程领域复杂工程问题，以获得有效结论。	2-1. 能够运用数学、自然科学和相关工程科学的基本原理，识别和判断能源动力工程领域复杂工程问题的关键环节；
	2-2. 能够基于相关科学原理和数学模型等对复杂工程问题进行有效表达；
	2-3. 能够认识到能源动力工程领域工程问题有多种解决方案，并能够通过文献研究寻求有效解决方案；
	2-4. 能够运用相关的基本原理，借助文献研究，分析能源与动力工程领域相关复杂工程问题的影响因素，并得到有效结论。
毕业要求 3：	3-1. 掌握能源与动力工程设计和产品开发全周期、全流程的基本设计/开发方法和技术，了解影响设计和技术方案的各种因素；

设计/开发解决方案：能够运用能源与动力工程相关学科基础知识，设计满足特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。	3-2. 能够针对能源与动力领域的设备所要满足的特定需求，完成相关设计；
	3-3.能够考虑社会、健康、安全、法律、文化以及环境等因素,对能源动力装置或工艺流程进行设计，并在设计环节中体现创新意识。
	3-4. 能够在能源与动力工程装置或工艺流程设计过程中，考虑环保、法律、安全等制约条件和可接受的指标；
毕业要求 4： 研究：能够基于科学原理并采用科学方法对能源与动力工程领域问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。	4-1. 能够基于科学原理对能源动力领域复杂工程问题，调研、分析并提出解决方案；
	4-2. 能够根据能源动力工程问题中的研究对象特征，确定研究路线，设计合理实验方案；
	4-3. 能够根据实验方案构建实验系统，运用能源与动力工程领域相关理论、方法，安全地开展实验，采集实验数据；
	4-4. 能够对实验结果进行分析，获得有效数据和解释，并通过信息综合得到合理有效的结论。
毕业要求 5： 使用现代工具：能够针对能源动力领域复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对能源动力领域复杂工程问题的预测与模拟，并能够理解其局限性。	5-1. 了解用于能源与动力工程专业常用现代仪器、信息技术工具、工程工具和模拟软件的使用原理和方法，并理解其局限性；
	5-2. 能够选择与使用恰当的仪器、信息资源、工程工具和专业模拟软件，对能源动力领域复杂工程问题进行分析、计算与设计；
	5-3. 能够针对具体的对象，开发或选用满足特定需求的现代工具，模拟和预测能源与动力专业问题，并能够分析其局限性。
毕业要求 6： 工程与社会：能够基于能源与动力工程相关的背景知识进行合理分析，评价能源与动力工程专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。	6-1. 了解能源与动力工程专业相关领域的技术标准体系、知识产权、产业政策和法律法规，理解不同社会文化对工程活动的影响；
	6-2. 能够分析和评价能源与动力专业工程实践与社会、健康、安全、法律、文化的影响，以及这些制约因素对项目实施的影响，明晰在专业工程活动中应承担的社会责任。
毕业要求 7： 环境和可持续发展：能够理解和评价针对能源动力工程领域复杂工程问题的工程实践对环境、社会可持续发展的影响。	7-1. 了解国家对环境、社会可持续发展的战略及相关政策、法律和法规，知晓能源与动力工程专业工程实践中环境保护和可持续发展的理念和内涵；
	7-2. 能够站在环境保护和可持续发展的角度思考能源与动力工程专业工程实践的可持续性，评价产品周期中可能对人类和环境造成的损害和隐患。
毕业要求 8： 职业规范：具有人文社会科学素养、社会责任感，能够在能源与动力专业相关领域的工程实践中理解并遵守工程职业道德和规范，履行责任。	8-1. 具有正确的人生观和价值观，正确认识个人在社会及自然环境中的地位，了解中国国情；
	8-2.理解诚实公正、诚信守则的工程职业道德和规范，并能在工程实践中自觉遵守；
	8-3. 理解能源与动力工程领域工程师对公众的安全、健康和福祉，以及环境保护的社会责任，能够在工程实践中自觉履行责任。
毕业要求 9： 个人和团队：能够在从事以能源与动力工程为主体的多学科背景下的团队中承担个体、团队成员以及负责人的角色。	9-1. 理解多学科背景下，个人和团队的关系，具有良好的团队合作意识和能力，能够有效沟通，并能够独立或合作开展工作；
	9-2. 能够在多学科背景团队中组织、协调和指挥团队开展工作
毕业要求 10： 沟通：能够就能源动力工程领域复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述	10-1. 能够通过口头、文稿或图纸等技术文件对能源与动力工程专业领域问题进行准确表达观点、辩论，理解与业界同行和社会公众交流的差异性；
	10-2. 了解能源与动力工程专业相关行业的热点问题与国际发展趋势，理解和尊重世界不同文化的差异性和多样性；

发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。	10-3. 掌握一门外语，能够在跨文化背景下，就能源与动力工程专业问题进行语言交流和书面表达。
毕业要求 11： 项目管理：理解并掌握能源动力领域工程管理原理与经济决策方法，并能在多学科环境中应用。	11-1. 掌握能源动力领域的工程管理原理与经济决策方法，并能在多学科环境下（包括模拟环境），在设计开发解决方案的过程中，运用工程管理与经济决策方法；
	11-2. 了解能源与动力工程及相关产品全周期、全流程的成本构成，理解其中涉及的工程管理与经济决策问题；
毕业要求 12： 终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。	12-1. 能在社会发展的大背景下，跟踪现代能源动力工程技术发展，具备自主学习和终身学习、拓展与更新知识的意识。
	12-2. 针对个人与社会发展需求，能够运用科学发展观，秉持创新思维与科学的求变、求新精神，实现自主学习、知识更新、技能提高，具备完善自我和适应行业和社会发展的能力。

专业毕业要求应该能够支撑培养目标的达成。建立本专业毕业要求支撑培养目标实现的关系矩阵。

毕业要求支撑培养目标实现的关系矩阵

毕业要求	培养目标			
	培养目标 1	培养目标 2	培养目标 3	培养目标 4
1: 工程知识	√			
2: 问题分析		√		
3: 设计/开发解决方案		√		
4: 研究		√		
5: 使用现代工具		√		
6: 工程与社会	√			
7: 环境和可持续发展	√			
8: 职业规范			√	√
9: 个人和团队			√	
10: 沟通			√	√
11: 项目管理			√	
12: 终身学习				√

四、主干学科

动力工程及工程热物理、机械工程

五、专业核心课程

理论力学、材料力学、带式运输机传动系统设计(包含工程制图及 CAD, 机械设计基础)、工程材料、电工学、自动控制原理、C 语言程序设计、工程热力学、工程流体力学、传热学、燃烧理论与污染控制、能源动力测试技术、锅炉原理、汽轮机原理。

六、修业年限

本科基本学制 4 年，弹性学习年限 3-6 年，按照学分制度管理。

七、授予学位

学生应至少修满 171 学分方可毕业。符合《沈阳化工大学本科毕业生学士学位授予工作有关规定(2017 年 3 月修订)》学位授予条件者，可授予工学学士学位。

八、学分要求

课程类别	课程模块		课程性质	学分要求	小计	比例（%）
通识教育课	通识教育必修课	思政类	必修	17	41	23.98
		外语类		12		
		计算机类		2		
		军事安全类		2		
		劳动体育类		5		
		创新创业类		2		
		心理健康类		1		
	通识教育选修课	美育类(400)	选修	2	8	5.85
		中国与世界(500)		2		
		四史(600)		1		
		经济管理类(700)		1		
		传统文化(900)		2		

	通识教育实践课	军训	实践	2	2	
学科平台课	学科基础课程	公共基础类	必修	61.5	63.5	70.18
		专业基础类				
	学科实践课程	-	实践	2		
专业教育课	专业核心课程	-	必修	13.5	47.5	
	专业选修课程	-	选修	6		
	专业实践课程	-	实践	28		
能力拓展课	专业特色课程	-	必修（或实践）	9	9	
课外环节	课外通识实践	人文社会实践	课外实践	4		
		身心健康实践				
		外语技能实践				
	创新创业实践	创新训练		4		
		创新大赛				
		创新活动				
	生涯教育	成长规划类		1		
总学分/比例					171	100

Energy and Power Engineering Major 2021

Undergraduate Education Program

I、 Educational Objectives

To meet the needs of national and regional development, the major cultivates the applied engineering talents having good humanistic qualities, correct socialist core values and solid professional knowledge. They can adapt to the needs of economic and social development and the progress of industry science and technology. They are able to engaged in technology development, process and equipment design, installation, production and management, teaching and scientific research in the fields of thermal energy engineering, power engineering, refrigeration and air conditioning engineering, environmental protection, etc. They are applied technical talents with practical engineering ability and innovative consciousness. They are qualified builders and reliable successors of the socialist cause with comprehensive development of morality, intelligence, physique, aesthetics and labor.

The expectations of the students trained by the major about five years after graduation:

- (1) Be able to skillfully use the fundamental and professional knowledge of mathematics, natural science and energy and power engineering. And be able to comprehensively consider economic, environmental, legal, safety and other factors to solve complex practical engineering problems in the field of energy and power engineering. Be able to become engineers and core technicians in the field of energy and power engineering.
- (2) In the enterprise and social environment, be able to use of relevant principles and basic engineering design theory to critically analyze, research and develop energy conversion and utilization devices and systems by using modern tools.
- (3) Have the sense of social responsibility, good humanistic qualities, professional ethics and the concept of sustainable development. They have innovation and teamwork consciousness and have the ability to communicate, communicate and manage project.
- (4) Be able to adapt to the needs of modernization construction and social development, have the ability of independent learning and lifelong learning, and have a sustainable development concept and international vision. They are able to show responsibility and progress in professional development, and to constantly improve themselves and their professional development capabilities.

II、 Major direction

No direction in this major

III、Graduation Requirements

Graduates should obtain knowledge and competences as follows:

Graduation Requirements	Indices
Requirement 1: Engineering knowledge: be able to use mathematics, natural science, engineering foundation and professional knowledge to solve complex engineering problems in the field of Energy and Power Engineering	1-1. Master natural science knowledge such as mathematics, physics and chemistry, and be able to make statement about engineering problems.
	1-2. Master relevant engineering foundation and professional knowledge, and be able to establish models and solve specific engineering problems.
	1-3. Master the necessary fundamental professional knowledge and be able to establish modeling methods, then deduce, analyze and research the problem in the field of Energy and Power Engineering.
	1-4. Master the professional knowledge to comprehensively compare and analyze the solutions of complex engineering problems in the field of Energy and Power Engineering.
Requirement 2: Problem analysis: be able to apply the basic principles of mathematics, natural science and relevant engineering to identify, express and analyze complex engineering problems of energy conversion in the field of Energy and Power Engineering through literature research, so as to obtain effective conclusions.	2-1. Be able to use the basic principles of mathematics, natural science and relevant engineering to identify and judge the key parts of complex engineering problems in the field of Energy Power Engineering.
	2-2. Be able to effectively express the complex engineering problems of based on relevant scientific principles and models.
	2-3. Be able to recognize that there are multiple solutions to the problem in the the field of Energy and Power Engineering and the effective solution can be found by literatures research.
	2-4. Be able to apply the relevant basic principles to analyze influencing factors and draw the effective conclusions through literature research.
Requirement 3: Design / development solutions: be able to use the basic knowledge related to Energy and Power Engineering to design the system, unit (component) or process meeting the specific needs, and be able to reflect the sense of innovation in the design process, taking society, health, safety, legislation, culture and environment into account.	3-1. Master the basic design / development methods and technologies of the whole cycle and process of energy and power engineering design and product development, and understand various factors affecting the design and technical schemes.
	3-2. Be able to complete the relevant design of the equipment meeting the specific needs in the field of Energy and Power Engineering
	3-3. Be able to design the system and technological process meeting the specific needs and embody the sense of innovation in the design process based on considering the society, health, safety, legislation, culture and environmental factors.
	3-4. Be able to consider environmental protection, law, safety and other constraints as wall as acceptable indicators in the design of energy and power engineering devices or process
Requirement 4: Research: be able to study the complex engineering problems in the field of Energy and Power Engineering based on scientific principles and methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.	4-1. Be able to investigate, analyze and propose solutions to complex engineering problems of energy conversion and utilization devices and systems based on scientific principles.
	4-2. Be able to put forward research route and design the reasonable experimental scheme.
	4-3. Be able to build experimental systems according to the scheme, conduct the experiment safely and collect the experimental data by using the related theories in the fields of the Energy and Power Engineering
	4-4. Be able to obtain the effective data and interpretation by analyzing the experimental results, and then obtain the effective research conclusions based on comprehensive information.

Requirement 5: Use modern tools: be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for complex engineering problems in the field of Energy and Power Engineering, including prediction and simulation of complex engineering problems of the energy and power equipment and the systems, and understand their limitations.	5-1. Understand the principle and method of the common modern instruments, information technology tools, emerging tools and simulated software in the in the field of Energy and Power Engineering, and be able to understand their limitations.
	5-2. Be able to select and use appropriate instruments, information resources, emerging tools and simulated software to complete the work of analyzing, computing and designing the complex engineering problems in the field of Energy and Power Engineering.
	5-3. Be able to select or develop the modern tools for the specific problem. Be able to simulate and predict engineering problems of the major of Energy and Power Engineering and understand their limitations.
Requirement 6: Engineering and society: be able to perform reasonable analysis based on the background knowledge related to professional engineering, evaluate the impact of professional engineering practice and complex engineering problem solutions on society, health, safety, law and culture, and understand the responsibilities.	6-1. Understand the technical standards systems, intellectual property rights, industrial policies and laws and regulations in the fields of Energy and Power Engineering, and be able to understand the impact of different social cultures on engineering activities.
	6-2. Be able to analyze and evaluate the relationship between the engineering practices of Energy and Power Engineering major and the social, health, safety, law and culture, and clarify the social responsibility in professional engineering activities.
Requirement 7: Environment and sustainable development: be able to understand and evaluate the impact of engineering practice aiming at complex engineering problems in the field of energy and power engineering on the environmental and social sustainable development	7-1. Understand the national strategy for environmental and social sustainable development as well as the relevant policies, laws and regulations, and understand the concept and connotation of environmental protection and sustainable development in the engineering practice of Energy and Power Engineering.
	7-2. Be able to consider the sustainability of the engineering practice of energy and power engineering from the perspective of environmental protection and sustainable development, and be able to evaluate the possible damage and hidden dangers to human beings and the environment in the product cycle.
Requirement 8: Professional norms: have good humanities and social sciences literacy, strong sense of social responsibility, and be able to understand and abide by engineering ethics and norms in engineering practice in the fields related to energy and power specialty, and fulfill responsibilities	8-1. Have a correct outlook on life and values, correctly understand the status of individuals in the social and natural environment, and understand China's national conditions
	8-2. Understand the engineering professional ethics and norms of honesty, justice and integrity code, and be able to consciously abide by them in engineering practice.
	8-3. Understand the social responsibility of engineers in the field of energy and power engineering for the safety, health and well-being of the public and environmental protection, and be able to consciously perform their responsibilities in engineering practice.
Requirement 9: Individuals and teams: be able to assume the roles of individuals, team members and leaders under the Multi-disciplinary Background of energy and power engineering.	9-1. Understand the relationship between individuals and teams in a multidisciplinary context, and have a good sense and ability of teamwork. Be able to communicate effectively, and work independently or cooperatively.
	9-2. Be able to organize, coordinate and direct the work of the team in a multidisciplinary team.

Requirement 10: Communication: ability to effectively communicate and interact with industry colleagues and the public on complex engineering problems in the energy and power field, including writing reports, designing manuscript, making presentations, clearly expressing or responding to instructions. And have a certain international vision and the ability to communicate and exchange in the cross-cultural background	10-1. Be able to accurately express opinions and debate on issues in the professional field of energy and power engineering through technical documents such as headlines, manuscripts or drawings, and understand the differences in communication with peers in the industry and the public.
	10-2. Understand the hot issues and international development trends of energy and power engineering related industries, and understand and respect the differences and diversity of different cultures in the world.
	10-3. Master a foreign language and be able to conduct language communication and written expression on professional issues of energy and power engineering in a cross-cultural context.
Requirement 11: Project management: understand and master the engineering management principles and economic decision-making methods in the field of energy and power, and be able to apply them in a multidisciplinary environments.	11-1. Master engineering management principles and economic decision-making methods in the field of energy and power, and be able to use engineering management and economic decision-making methods in the process of designing and developing solutions in a multidisciplinary environment (including simulation environment).
	11-2. Understand the cost composition of the whole cycle and whole process of energy and power engineering and related products, and understand the engineering management and economic decision-making problems involved.
Requirement 12: Life-long learning: Have the consciousness of self-learning and life-long learning, and have the ability to keep learning and adapt to development	12-1. Be able to track the development of modern energy power engineering technology in the background of social development. Have the consciousness of autonomous learning and lifelong learning, expanding and updating knowledge.
	12-2. Be able to use the scientific concept of development to achieve self-learning, knowledge updating and skill improvement, according to the needs of personal and social development. And have the ability to improve oneself and adapt to the development of the industry and society.

The relationship between graduation requirements and educational objectives

Graduation Requirements	Educational Objectives			
	Educational Objectives 1	Educational Objectives 2	Educational Objectives 3	Educational Objectives 4
1: Engineering Knowledge	√			
2: Problem Analysis		√		
3: Design/Development Solutions		√		
4: Research		√		
5: Use Modern Tools		√		
6: Engineering and Society	√			
7: Environment and Sustainable Development	√			
8: Career Planning			√	√
9: Individuals and Teams			√	
10: Communicate			√	√
11: Project Management			√	
12: Lifelong Learning				√

Power Engineering and Engineering Thermo-physics Mechanical Engineering

V、Core Courses

Theoretical mechanics、Mechanics of Materials、Belt Conveyor Drive System Design (including Engineering Drawing & CAD、Machine Design Foundation、Engineering Material、Electrical Engineering、Principle of Automatic Control、C Language Programming、Engineering Thermodynamics、Engineering Fluid Mechanics、Heat transfer Theory、Combustion Theory and Pollution Control, Energy and Power Testing Technology、Boiler principles、Steam Turbine principles

VI、Educational System

The basic undergraduate length of schooling is 4 years, and the flexible study period is 3-6 years. It is managed according to the credit system.

VII、Confer Degrees

Students should complete at least 171 credits before graduation. The Bachelor of engineering degree can be granted to those who meet the degree awarding requirements of the relevant regulations on the awarding of bachelor's degree for graduates of Shenyang University of Chemical Technology (revised in March 2017).

VIII、Credit Requirements

Course Type	Course Modules		Course Nature	Credit requirement	Subtotal	Proportion (%)
General Education	General Education (Compulsory)	Ideological and Political Courses	Compulsory	17	41	23.98
		Foreign Language Courses		12		
		Computer Courses		2		
		Military and Safety Courses		2		
		Labor and Sport Education		5		
		Innovation and Entrepreneurship		2		
		Mental Health		1		
	General Education (Optional)	Aesthetic Education (400)	Optional	2	8	5.85
		China and the world (500)		2		
		Four Histories (600)		1		
		Economic Management		1		

		(700)				
		Traditional Culture (900)		2		
			Military Training		2	
Discipline Education	Basic Courses	Public basic Course	Compulsory	61.5	63.5	69.77
		Professional foundation				
	Basic Practice Sessions	-	Practice	2		
Specialized Education	Core Courses	-	Compulsory	13.5	47.5	
	Optional Courses	-	Optional	6		
	Specialized Practice Sessions	-	Practice	28		
Competency Development	Individualized Courses	-	Compulsory(or Practice)	9	9	
Extracurricular links	Extracurricular General Education Practice	Culture and Society Practice	Extracurricular Practice	4		
		Mentally and Physically Practice				
		Foreign Language Proficiency Training Practice				
	Extracurricular Characteristic Practice	Innovative Training		4		
		Innovation Competition				
		Chuangke Activities				
	Career Education	Growth Planning Courses		1		
Total/Proportion					171	100

九、能源与动力工程专业教学进程表

Table of Teaching Schedule for Energy and Power Engineering Major

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学 分 Credits	总学时 Total Credit Hours	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备 注 Notes
							讲 课 Lecture	实 验 Experiment	上 机 Programming	课 外 实 践 Practice	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
通识教育课 General Education	必修 Compulsory	思政类 Ideological and Political Courses	0710093001	思想道德与法治 Ideological Morality and the rule of Law	3.0	48	32			16		2							
			0710053001	中国近现代史纲要 Outline of Chinese Contemporary and Modern History	3.0	48	32			16	2								
			0710103001	马克思主义基本原理* Basic Principle of Marxism*	3.0	48	32			16			2						
			0710123001	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	3.0	48	40			8				3					
			0710133001	毛泽东思想和中国特色社会主义理论体系概论* Mao Zedong Thought and Theory of Socialism with Chinese Characteristics*	3.0	48	32			16				2					
			0710012301	形势与政策 Current Situation and Policies	2.0	64	64				2	2	2	2	2	2	2	2	
			外语类 Foreign Language Courses	0211003101	大学外语I College EnglishI	3.0	48	48				3							
	0211003201	大学外语II* College English *		3.0	48	48					3								

		0241003301	大学外语III College English III	3.0	48	32			16			3						五选一
			大学外语III（进阶英语） College English III（Advanced English CET 6-Orientated）	3.0	48	48						3						
			大学外语III（英语口语表达与交流） College English III（English Oral Expression and Communication）	3.0	48	48						3						
			大学外语III（跨文化交际） College English III（Intercultural Communication）	3.0	48	48						3						
			大学外语III（英语写作表达与交流） College English III（English Writing Expression and Communication）	3.0	48	48						3						
		0241003401	大学外语IV* College English IV*	3.0	48	48							3					五选一
			大学外语IV（进阶英语） College EnglishIV（Advanced English CET 6-Orientated）	3.0	48	48							3					
			大学外语IV（英语口语表达与交流） College EnglishIV（English Oral Expression and Communication）	3.0	48	48							3					
			大学外语IV（跨文化交际） College English IV（Intercultural Communication）	3.0	48	48							3					
			大学外语IV（英语写作表达与交流） College English IV（English Writing Expression and Communication）	3.0	48	48							3					
	计算机类 Computer Courses	1614262001	计算机信息技术 Computer Information Technology	2.0	36	24		12		2								
		0710081001	军事理论 Military Theory	1.0	16	16					2							

	军事安全类 Military and Safety Courses	2114031712	安全教育 Safety Education	1.0	16	16				2	2	2	2	2	2	2		
	劳动体育类 Labor and Sport Education	2640021001	劳动教育 Labour Education	1.0	16	16					2							
		0410011101	大学体育I College Physical EducationI	1.0	36	36				2								
		0410021201	大学体育II College Physical EducationII	1.0	36	36					2							
		0410031301	大学体育III College Physical EducationIII	1.0	36	36						2						
		0410041401	大学体育IV CollegePhysical EducationIV	1.0	36	36							2					
	创新创业类 Innovation and Entrepreneurship courses	2154011002	创造性思维与创新方法 Creative Thinking and Innovative Methods	1.0	16	16								2				
		1740011001	创业基础 Entrepreneurial Foundation	1.0	16	16							2					
	心理健康类 Mental Health Courses	0510041001	大学生心理与健康教育 Mental and Health Education for College Students	1.0	16	16				2								
	小计 Subtotal				41	772	688	0	12	72								
选修 Optional		分为经济管理类（1.0）、美育类（2.0）、科学技术类（1.0）、四史（1.0）、传统文化（2.0）、中国与世界（1.0）课程类6个模块 每个模块最多选修2.0学分，每学期最多选修2门课程。 Including 6 modules: Economic Managemenst, Aesthetic Education , Science and Technology,Four Histories, Traditional Chinese Culture, China and TheWorld. Up to2.0 credits per module and up to 2 courses per semester.																
		小计 Subtotal				8.0												
实践 Practice	0415102011	军训 Military Training	2.0	48				48	+2									集中
合计 Total				10.0														

学科平台课 Discipline Education	必修 Compulsory	数学与自然科学类 Natural Science & Mathematics	0310004101	高等数学 I* Advanced Mathematics I*	4.5	80	72			8	6							
			0310005201	高等数学 II* Advanced Mathematics II*	5.5	96	88			8		6						
			0310032001	线性代数 Linear Algebra	2.0	32	32						2					
			0310042001	概率论与数理统计 Probability and Statistics	2.0	32	32							2				
			0310063101	大学物理 I University Physics I*	3.0	48	46	2				3						
			0310063201	大学物理 II University Physics II*	3.0	48	46	2					3					
			0311073001	大学化学 College Chemistry	3.0	48	48				3							
			0310101111	大学物理实验 I Physical Experiment of college I	1.0	24	6	18				3						
			0310101211	大学物理实验 II Physical Experiment of college II	1.0	24		24					3					
			0311091011	大学化学实验 College Chemistry Experiment	1.0	24		24				4						
		工程基础类 Foundation Engineering	1613253001	C 语言程序设计 C Language Programming	3.0	56	32		24			3						
			1510122001	电工学 Electrical Engineering	2.5	44	32	12					3					
			2110014302	带式运输机传动系统设计 1(II 级项 目)# Design of Belt Conveyor Transmission system—Theory courses1(level II project)#	4	64							4					CDIO 课 程
			2110024302	带式运输机传动系统设计 2(II 级项 目)# Design of Belt Conveyor Transmission system—Theory courses2(level II project)#	4	64								4				CDIO 课 程
			1401152002	工程材料 Engineering Material	2.0	32	24	8						4				
		专业基础类 Subject Foundation Requisite	2117013002	工程热力学* Engineering Thermodynamics*	3.0	48	48						4					
			2117023002	工程流体力学* Engineering Fluid	3.0	48	48							4				

			Mechanics*															
		2110083002	理论力学 A* Theoretical Mechanics A*	3.0	48	48						4						
		2110063002	材料力学 B* Mechanics of Materials B*	3.0	48	40	8						3					
		2117033002	传热学* Heat Transfer Theory*	3.0	48	48								4				
		1511532002	自动控制原理 Principle of Automatic Control	2.0	32	28	4								2			
		2117071002	能源与动力工程专业英语 Professional English for Energy and Power Engineering	1.0	16	16									2			
		2117081002	专业文献检索与科技写作 Professional Literature Retrieval and Scientific Writing	1.0	16	16										2		
		2115011002	工程项目管理 Project Management	1.0	16	16										2		
		小计 Subtotal			61.5	1036	894	102	24	16								
	实践 Practice	2110072031	金工实习 Metalworking Practice	2.0	48		48							+2				
小计 Subtotal			2.0															
合计 Total				63.5	48		48											
专业教育课 Specialized Education	必修 Compulsory	2120013302	工程导论 Introduction to Majors	1.0	16	16				2								
		2117142002	燃烧理论与污染控制* Combustion Theory and Pollution Control	2.5	40	40							4					
		2117092002	锅炉原理* Boiler Principle*	2.5	40	40								4				
		2117103002	热工设备设计原理 Design Principle of Thermal Equipment	3.0	48	48								4				
		2117122002	汽轮机原理* Turbine Principle*	2.5	40	40									4			
		2117132002	能源动力测试技术* Energy and Power Testing Technology*	2.0	32	32									2			
		小计 Subtotal			13.5	216	216				2				4	10	4	
		2137162002	泵与风机 Pump and Fan	2.0	32	32								2				

选修 Optional	2132622002	弹性力学(双语) Elastic Mechanics(dual-language)	2.0	32	32									2				
	2130182702	制造技术 Manufacturing Technology	2.0	32	32									2				
	2137182002	传热学数值计算 Numerical Calculation of Heat Transfer	2.0	32	32										2			
	2130202002	能源发展与环境保护 Energy Development and Environmental Protection	2.0	32	32											2		
	2137202002	洁净煤技术 Clean Coal Combustion Technology	2.0	32	32										2			
	2137212002	新能源发电技术 New Energy Utilization	2.0	32	32											2		
	2137222002	制冷原理与设备 Refrigeration Principle	2.0	32	32										2			
	2137232002	空气调节与设计 Air Condition and Design	2.0	32	32											2		
	2137242002	热力发电厂 Thermal Power Station	2.0	32	32											2		
	小计 Subtotal		6.0	96	96													
	要求至少修满 6 学分 At least 6 credits are required																	
	实践 Practice	2117251032	认识实习 Cognition Practice	1.0	24		24			+1								集中
		2117263032	生产实习 Specialized Production Practice	3.0	72		72								+3			集中
2117251002		能源与动力工程专业实验 Experiment of Energy and Power Engineering	2.0	48		48					4	4	4	4	4		分散	
2117304022		热工设备设计(III 级项目) Design of Thermal Equipment(Level III Project)	5.0	120		120									+5		集中 CDIO 课程	
2117282022		汽轮机原理课程设计(III 级项目) Curriculum Design of Steam Turbine Principle(Level III Project)	3.0	72		72										+3	集中 CDIO 课程	

			2118081042	毕业设计（论文） Graduation Design（Thesis）	14.0	336		336									+14	分散 CDIO 课程
			小计 Subtotal		28	672		672										
			合计 Total		47.5													
能力拓展课 Competency Development	必修或实践 Compulsory or Practice		2120013302	工程导论(I 级项目) Introduction to Majors (Level I Project)	2.0	48		48				4						分散 CDIO 课程
			2110015322	带式运输机传动系统设计 3(II 级项目) # Design of Belt Conveyor Transmission System3 (Level II Project) #	5.0	120		120					32	32	32			分散
			2117082002	能源动力设备数值模拟（双语） Numerical Simulation Technology of Energy Power Equipment	2.0	32	8		24							2		
			小计 Subtotal		9.0	200	8	168	24									
			（要求修满 9.0 学分 9.0 credits are required）															
课外 环节 Extracurricular practice	课外实践 Extracurricular practice	人文社会实践 Culture and Society Practice	2110301052	社会调查 Social Survey	0.5	12				12							0.5	分散
		身心健康社会实践 Mentally and Physically Practice	0410050751	课外体育锻炼 Extracurricular Physical Exercise	0.5	12				12							0.5	分散
			2640030011	劳动教育实践 Labour Education Practice	0.5	12				12		0.5						分散
			0510070311	心理健康辅导 Mental Health Counseling	0.5	12				12							0.5	分散
		外语技能实践类 Foreign Language Proficiency Training Practice	0210010011	外语技能实践（初级） Foreign Language Proficiency Training Practice（elementary）	2.0	48				48				2				二选一
			0210020011	外语技能实践（高级） Foreign Language Proficiency Training Practice（advanced）	2.0	48				48				2				

	能力与创新实践 Capability and Innovation Practice	2110194012	大学生素质拓展与创新实践 Quality Development and Innovation Practice	4.0	96				96	1~8 学期依据《沈阳化工大学创新创业实践学分认定办法》由创新创业学院认定								分散
	成长规划类 Growth Planning Courses	2110011012	职业规划与就业指导 Career Planning and Employment Guidance	1.0	40	40						2	2	2	2			
总计 Sum				171.0	3088	1902	990	60	136	25.5	24.5	26.5	26	18.5	19.5	14.5	16	每学期学 分小计

理论课 1 学分 16 学时，实验课程、上机等 1 学分 24 学时，体育课 1 学分 36 学时，集中实践环节 1 个教学周计 1 学分，学分最小单位为 0.5,课程名称中画*为考试课。

#该课程为项目式教学课程，包含工程制图及 CAD、机械设计基础、公差与配合等课程整合，理论占 8 学分，实践占 5 学分。

十、能源与动力工程专业学士学位课程一览表

A list of bachelor's degree programs in Energy and Power Engineering

课程类别 Course Type	模块名称 Modules	序号 No.	课程编号 Course Codes	课程名称 Course Name	学分 Credits	开课学期 Semester
通识教育课 General Education	政治理论 Political Theory	1	0710103001	马克思主义基本原理 Elementary Theory of Marxism	3	3
		2	0710023201	毛泽东思想和中国特色社会主义理论体系概论* Mao Zedong Thought and Theory of Socialism with Chinese Characteristics II	3	5
学科平台课 Discipline Education	数学 Mathematics	3	0310004101	高等数学I* Advanced Mathematics I*	5	1
		4	0310005201	高等数学II* Advanced Mathematics II*	6	2
	物理 Physics	5	0310063101	大学物理I* University Physics I*	3	2
	化学基础 Foundations of Chemistry	6	0311073001	大学化学 College Chemistry	3	1
	专业基础 Subject Foundation Requisite	7	2110083002	理论力学 A* Theoretical Mechanics A*	3	3
		8	2110063002	材料力学 B* Mechanics of Materials B*	3	4
		9	1510122001	电工学 Electrical Engineering	2.5	3
		10	2117013002	工程热力学* Engineering Thermodynamics	3	3
		11	2117023002	工程流体力学* Engineering Fluid Mechanics	3	4
		12	2117033002	传热学* Heat Transfer Theory	3	5
专业教育课 Specialized Education	能源动力类 Energy and power	13	2117092002	锅炉原理* Boiler Principle	2.5	6
		14	2117132002	能源动力测试技术 Energy and Power Testing Technology	2	6
		15	2117122002	汽轮机原理* Principle of Steam Turbine	2.5	7

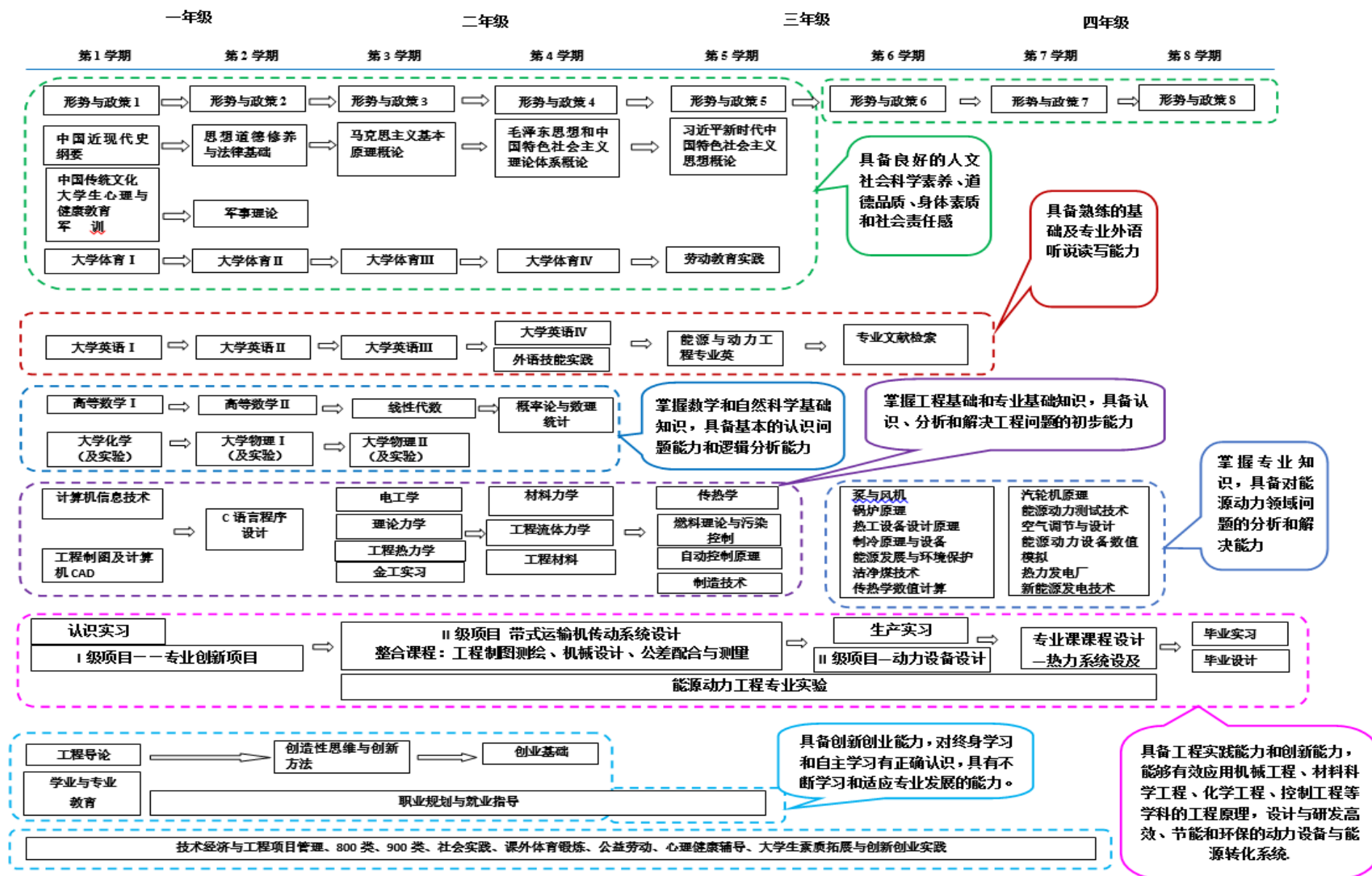
十一、全学程实践环节周历安排 Weekly Calendar of all Practice Sessions

学期	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	备注
一	☆	☆													▼			::	::	•		
二																		::	::	•		
三																		::	::	•		
四														※	※			::	::	•		
五																		::	::	•		
六										/	/	/	△	△	△	△	△	::	::	•		
七													△	△	△			::	::	•		
八	=	=	=	=	=	=	=	=	=	=	=	=	=	=								

符号说明(Symbol Description):

※金工实习||Metalworking Practice △课程设计||Curriculum Design /生产实习||Specialized Production Practice L 专业实验||Specialty Experiment P 各类实训、学年论文||Practical Training、Term Paper :: 考试||Examination ▼认识实习||Cognition Practice ☆军训||Military Training = 毕业设计（论文）||Graduation Project(Thesis) • 小学期||Primary Term

十二、课程体系配置图 Curriculum System Configuration Diagram



十三、主要课程与毕业能力要求关系矩阵图（相关性强 H，相关性中 M，相关性弱 L）

Correlation Matrix between Key Courses and Graduation Requirements (High Correlation—H, Medium Correlation—M, Low Correlation—L)

[illegible]

[illegible]

课程 (Courses)	毕业能力要求 (Graduation Requirements)																																
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	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	
能源与动力工程 专业英语 Professional English for Energy and Power Engineering																													H			M	
专业文献检索与 科技写作 Professional Literature Retrieval and Scientific Writing																												H	H			M	
工程项目管理 Project Management											L																			H	H		
金工实习 Metalworking Practice																	M	H						H									
工程导论 Introduction to Majors							H	M			H																			H		H	
燃烧理论与污染 控制* Combustion Theory and Pollution Control				H					H		L						M		H	H													
锅炉原理 Boiler Principle				M			H		H		H								H														
热工设备设计原 理 Design Principle of Thermal Equipment							H		H										H								H						

[illegible]

课程 (Courses)	毕业能力要求（Graduation Requirements）																															
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	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
热力发电厂 Thermal Power Station									L		L																					
能源与动力工程 专业实验 Experiment of Energy and Power Engineering												H	H	L										M								
认识实习 Cognition Practice																	H			L			H									
生产实习 Specialized Production Practice																	H		M	H			H						L			
热工设备设计 （项目） Design of Thermal Equipment									M	H								H	M	H						H				H		
汽轮机原理课程 设计 Curriculum Design of Steam Turbine Principle				M		M		M		H															L	H						
毕业设计（论 文） Graduation Design（Thesis）								H								H	H	H							M	H					H	
工程导论(创新项目) Introduction to Majors (Creative Project)								H		M												H		L	H				H	H		

课程 (Courses)	毕业能力要求 (Graduation Requirements)																															
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	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
能源动力设备数值模拟技术（双语） Numerical Simulation Technology of Energy Power Equipment														H	H	H															M	
社会调查 Social Survey																					M											
课外体育锻炼 Extracurricular Physical Exercise																					L											
大学生素质拓展与创新实践 Quality Development and Innovation Practice																								H	H					H		H