能源化学工程

Energy Chemical Engineering

专业代码：081304T **学制：4 年**

Program Code：081304T **Duration：4 years**

培养目标：

培养适应新时期社会、经济、科学技术发展需要，能在化工和能源等行业从事研究开发、生产管理和工程设计等方面工作的“创新、创造和创业型”人才。预期毕业五年左右成为能源化工及相关领域的技术骨干或更高层次的人才。

目标 1：能一如既往地围绕在中国共产党的周围，坚持党的路线、方针，坚定不移的跟着党走，自觉投身到中华民族伟大复兴事业；在能源化学工程实践活动中体现强烈的家国情怀、高度的社会责任感和良好的职业道德。

目标 2：能适应新时期知识和技术的快速更新，灵活运用化学工程和能源工程的新知识、新技术进行独立的创新性思考，并在国际化协作环境下开展创造性活动，研究和解决能源化工领域的复杂问题；

目标 3：能进一步积累组织管理经验，能在能源化工项目的执行和管理中兼顾社会、健康、安全、法律、文化及环境等因素，具有良好的创业能力并致力于促进能源化工产业发展。

Educational Objectives:

To cultivate "innovative, creative and entrepreneurial" talents who can adapt to the needs of social, economic, scientific and technological development in the new era and engage in research and development, production management and engineering design in the energy chemical engineering (ECE) industries. It is expected to become a technical backbone or a higher academic degree holder in the ECE industry and related fields after graduation for about five years. He or she can

1)consistently adhere to the correct leadership of the party, voluntarily join the great rejuvenation cause of the Chinese nation, and demonstrate strong family feelings, high sense of social responsibility and good professional ethics in the practice of energy chemical engineering;

2)adapt themselves to the rapid update of knowledge and technology in the new era, and use the new knowledge and technology of chemical engineering and energy

engineering to conduct independent and innovative thinking, and carry out creative activities in an international collaborative environment to solve complex problems in the field of ECE industry;

3) further accumulate organizational management experience, can take into account social, health, safety, legal, cultural and environmental factors in the implementation and management of ECE projects, and have entrepreneurial ability and commitment to promote the development of ECE industry.

毕业要求：

№1.工程知识：能够将数学、自然科学、工程基础和专业知识应用于解决能源化学工程的复杂问题。

№1.1 能采用数学、自然科学和工程科学的语言表述能源化学工程问题。

№1.2 能针对具体的化工单元操作、能源转换和利用环节进行建模和求解。

№1.3 能将数理、工程和能源化工基础知识以及模型化研究方法应用于能源化工实际问题的推演和分析。

№1.4. 能将数理、工程和能源化工基础知识以及模型化研究方法应用于能源化工实际问题的比较和综合。

№2.问题分析：能够应用数学、自然科学和工程科学的基本原理，识别、表达并通过文献研究分析能源化学工程的复杂问题，以获得有效结论。

№2.1 能运用数学、自然科学和工程科学的基本原理，对能源化工的复杂工程问题识别和判断关键环节。

№2.2 能基于数学、自然科学、工程科学的基本原理和教学模型化方法正确表达能源化工的复杂工程问题。

№2.3 能认识到解决问题有多种方法可选择，会通过文献调研寻求可替代的解决方案。

№2.4 能运用数学、自然科学和工程科学的基本原理，借助文献调研，分析能源化工过程的影响因素，获得有效结论。

№3.设计/开发解决方案：能够设计针对复杂能源化学工程问题的解决方案，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。

№3.1 掌握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。

№3.2 能够针对能源化工领域的特定需求，完成单元（部件）的设计。

№3.3 在设计中能够考虑安全、健康、法律、文化及环境等制约因素。

№4.研究：能够基于科学原理并采用科学方法对能源化工的复杂问题进行研究，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 能够基于数学、自然科学和工程科学的原理，通过文献研究或相关方法，调研和分析复杂工程问题的解决方案。

№4.2 能够根据能源化工问题对象特征，选择研究路线、设计实验方案。

№4.3 能够根据实验方案构建实验系统，安全的开展实验。

№4.4 能对实验结果进行分析和解释，并通过信息综合得到合理有效的结论。

№5.使用现代工具：能够针对能源化工的复杂问题，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，包括预测与模拟能源化工的复杂问题，并能够理解其局限性。

№5.1 了解常用的化工过程控制现代仪器、能源化工信息技术工具、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，对能源化工的复杂工程问题进行分析、计算与设计。

№5.3 能够针对能源化工问题中的对象，开发或选用满足特定需求的现代工具，模拟和预测专业问题，并能够分析其局限性。

№6.工程与社会：能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂能源化学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 了解能源化工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 能分析和评价能源化工专业工程实践对社会、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，并理解应承担的责任。

№7.环境和可持续发展：能够理解和评价针对能源化工的工程实践对环境、社会可持续发展的影响。

№7.1 知晓和理解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化工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。

№8.职业规范：具有人文社会科学素养、社会责任感，能够在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 有正确的价值观，理解个人与社会的关系，了解中国国情。

№8.2 理解诚实公正、诚信守则的工作职业道德和规范，并能在能源化工工程实践中自觉遵守。

№8.3 理解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，能够在能源化工工程实践中自觉履行责任。

№9.个人和团队：能够在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 能与其他学科的成员有效沟通，合作共事。

№9.2 能够在团队中独立或合作开展工作。

№9.3 能够组织、协调和指挥团队开展工作。

№10.沟通：能够就能源化工复杂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。

№10.1 能就能源化工专业问题，以口头、文稿、图表等方式，准确表达自己的观点，回应质疑，理解与业界同行和社会公众交流的差异性。

№10.2 了解能源化工领域的国际发展趋势、研究热点，理解和尊重世界不同文化的差异性和多样性。

№10.3 具备跨文化交流的语言和书面表达能力，能就专业问题，在跨文化背景下进行基本沟通和交流。

№11.项目管理：理解并掌握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 掌握能源化工项目中涉及的管理与经济决策方法。

№11.2 了解工程及产品全周期、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。

№11.3 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。

№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，认识到自主和终身学习的必要性。

№12.2 具有自主学习的能力，包括对技术问题的理解能力，归纳总结的能力和提出问题的能力等。

Graduation requirements:

№1.*Engineering Knowledge*: *An ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of*

complex engineering problems.

No1.1 can express the ECE issues in the language of mathematics, natural sciences, and engineering science.

No1.2 can model and solve for specific chemical unit operations, energy conversion and utilization.

No1.3 can apply the basic knowledge of mathematics, engineering and ECE and modeling methods to the deduction and analysis of practical problems in ECE.

No1.4 can apply the basic knowledge of mathematics, engineering and energy and chemical engineering and modeling research methods to the comparison and synthesis of practical problems in ECE.

№2. *Problem Analysis*: *An ability to identify, formulate and analyze complex engineering problems, reaching to substantiated conclusions using basic principles of mathematics, science, and engineering.*

No2.1 can use the basic principles of mathematics, natural sciences and engineering science to identify and judge key aspects of complex engineering problems in ECE industry.

No2.2 can correctly express the complex engineering problems of ECE industry based on the basic principles of mathematics, natural sciences, engineering science and modeling methods.

No2.3 recognizes that there are many ways to solve problems, and alternative research solutions are sought through literature research.

No2.4 can apply the basic principles of mathematics, natural sciences and engineering sciences, and use literature research to analyze the influencing factors of energy and chemical processes and obtain effective conclusions.

№3.*Design / Development Solutions*: *An ability to design solutions for complex engineering problems and innovatively design systems, components or process that meet specific needs with societal, public health, safety, legal, cultural and environmental considerations.*

No3.1 Mastering the basic design/development methods and techniques for the whole cycle and full process in engineering design and product development.

No3.2 can complete the design of the unit (component) for the specific needs of the energy chemical engineering industry.

No3.3 can consider safety, health, legal, cultural and environmental constraints during the process design.

№4.*Research*: *An ability to conduct investigations of complex engineering problems based on scientific theories and adopting scientific methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.*

No4.1 can investigate and analyze solutions to complex engineering problems through literature research or related methods based on the principles of mathematics, natural sciences, and engineering science.

No4.2 can select research routes and design experimental plans according to the characteristics of ECE problems.

No4.3 can construct the experimental system according to the experimental scheme, and carry out the experiment safely.

No4.4 can analyze and explain the experimental results and obtain reasonable and effective conclusions through information synthesis.

№5.*Applying Modern Tools*: *An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.*

No5.1 can understand the principles and methods of using common instruments, energy and chemical information technology tools, engineering tools and simulation software for common chemical engineering process control, and understand the limitations.

No5.2 can select and use appropriate instruments, information resources, engineering tools and professional simulation software to analyze, calculate and design complex engineering problems in ECE industry.

No5.3 can develop or select modern tools that meet specific needs for objects in energy and chemical engineering, simulate and predict professional problems, and analyze their limitations.

№6. *Engineering and Society*: *An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.*

No6.1 understand the technical standards system, intellectual property rights, industrial policies and laws and regulations in the field of energy and chemical industry, and understand the impact of different social cultures on engineering activities.

No6.2 can analyze and evaluate the impact of energy and chemical engineering practice on society, health, safety, law, culture, and the impact of these constraints on

project implementation, and understand the responsibilities.

№7.*Environment and Sustainable Development*: *An ability to understand and evaluate the impact of professional engineering solutions in environmental and societal contexts and demonstrate knowledge of and need for sustainable development.*

No7.1 know and understand the concepts and implications of environmental protection and sustainable development.

No7.2 can consider the sustainability of energy chemical engineering practices from the perspective of environmental protection and sustainable development, and evaluate the damage and hidden dangers that may be caused to humans and the environment during the product cycle.

№8.*Professional Standards*: *An understanding of humanity science and social responsibility, being able to understand and abide by professional ethics and standards responsibly in engineering practice.*

No8.1 can understand the relationship between the individual and the society, and know China's national conditions with the core value of socialism.

No8.2 understands the professional ethics and norms of honesty, impartiality and integrity, and consciously abide by the practice of ECE.

No8.3 understands the safety, health and well-being of the public and the social responsibility of environmental protection, and be able to consciously fulfill their responsibilities in the practice of ECE.

№9.*Individual and Teams*: *An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary teams.*

No9.1 can effectively communicate with other members of different disciplines and work well together.

No9.2 can work independently or collaboratively within the team.

No9.3 can organize, coordinate and lead the team to work.

№10.*Communication*: *An ability to communicate effectively on complex engineering problems with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions, and communicate in cross-cultural contexts with international perspective.*

No10.1 can accurately express their opinions on the subject of energy and chemical industry by means of oral, manuscript, and chart, respond to questions, and understand the differences between the industry and the public.

No10.2 understand the international development trends, research hotspots in the field of energy and chemical industry, understand and respect the differences and diversity of different cultures in the world.

No10.3 have the language and written communication skills of cross-cultural communication, and can carry out basic communication and communication in a cross-cultural context on professional issues.

№11.*Project Management*: *Demonstrate knowledge and understanding of engineering management principles and methods of economic decision-making, to function in multidisciplinary environments.*

No11.1 master the management and economic decision-making methods involved in energy and chemical projects.

No11.2 understand the cost structure of the whole cycle and the whole process of engineering and products, and understand the engineering management and economic decision-making problems involved.

No11.3 can use engineering management in the process of designing and developing solutions in a multidisciplinary environment (including simulation environment)

№12.*Lifelong Learning*: *A recognition of the need for, and ability to engage in independent and life-long learning with the ability to learn continuously and adapt to new developments.*

No12.1 can recognizes the need for autonomous and lifelong learning in the context of social development.

No12.2 can learn autonomously, including the ability to understand technical issues, the ability to summarize and the ability to ask questions.

专业简介：（限 500 字以内）

本专业源于 2004 年教育部批准设立的“能源工程及自动化专业”，并于 2011 年获批为广东省特色专业。因应 2013 年教育部专业调整，通过专家评议和教育部审议，更名为“能源化学工程专业”。能源化学工程专业涉及天然气利用、石油加工和可再生能源等知识领域，研究以天然气、石油、可再生能源等自然资源为原料的能源开发、转化、输配及应用的共性化工问题。本专业通过现代能源化学工程的系统训练，培养具有一定专长的“宽厚、复合、开放、创新”型高级人才。作为教育部直属研究型大学的化学工程国家重点学科下属专业，能源化工专业不仅具有深厚的化工底蕴还肩负科技振兴能源相关产业、优化能源产业结构的社会

使命，为此在注重人才工程教育的同时也强调科研素养的培养，充分利用天然气资源利用、燃料电池研发和生物质能源开发等新能源过程的丰硕科研成果，采用教学与科研相互促进的良性人才培养模式。本专业 95%专业课由高级职称教师担任；拥有 200 多平方米的专业实验室及价值超过 300 万元的专业实验仪器。

Program Profile：

The discipline of energy chemical engineering (ECE) has been born after the peer review and the approval of Ministry of Education. This discipline originates from the energy engineering and automation, which was approved to establish in 2004, and has been honored as the featured discipline in Guangdong Province.

ECE has an important intercross with many other disciplines, like natural gas utilization, petrol processing and renewable energy, as ECE studies the common basic of energy conversation, transmission and utilization for both new and traditional energy resources. After the systematic trainings in the field of modern ECE, the well-educated professionals have been cultivated to gain the solid basic of knowledge and broadly international horizons together with exceptional ability.

As supported with the state key discipline of chemical engineering in South China University of Technology, directly administrated by MOE, ECE, strongly characterized as a branch of chemical engineering, bears the mission to realize the lofty ideal of national rejuvenation. In the professional education of ECE, the mutual promotion of undergraduate education and scientific research in the fields of natural gas utilization, fuel cells, biomass and so on will greatly help our students to become qualified engineers with the necessary scientific research qualities.

The faculty of ECE, including 14 Ph.D. supervisors, has strong background of engineering and scientific research. The 95% of specialty-related courses will be directly taught by the professors or associate professors. The ECE also has the specialty-related laboratories of over 200 square meters and instruments cost over 3 million RMB.

专业特色：

作为战略性新兴专业，依托“双一流学科”化学工程，通过“教、学、研”贯通培养满足国家能源发展战略的天然气、石油和新能源领域的综合性人才；以生为本，为学生成为高层人才提供充分上升通道和国际化交流渠道。

Program Features:

Based on the nationally reputed discipline of Chemical Engineering in South China University of Technology, we continually engage to cultivate the talent graduates with broadly international horizon, solid knowledge and strong ability by the pedagogical approach with the integration of learning, research and development. The high employment rate indicates that our graduates have been well trained to meet to the needs of natural gas, petrol and renewable energy industry in China. The active frontier exploration and international education can facilitate the development of Energy Chemical Engineering.

授予学位：工学学士

Degree Conferred: Bachelor of Engineering

核心课程：

流体力学、传热学、传质与分离工程、化学反应工程、化工过程系统工程、工程热力学、燃烧学、化工设备机械基础、化工过程控制原理与仪表、能源化工设计

Core Courses:

Fluid mechanics, heat transfer, mass transfer and separation, chemical reaction engineering, Chemical process systems engineering, engineering thermodynamics, combustion science, mechanical basic of chemical engineering equipment, Chemical Process Control Principles and Instruments, Energy Chemical Engineering Design

特色课程：

新生研讨课：现代电化学储能技术、能源与化工的光影交织未来
MOOC：计算机辅助设计，小白学人工智能
基于项目（设计、案例）的课程：能源系统-多能互补与梯级利用
学科前沿课：学科前沿讲座
本研共享课：天然气水合物原理与技术，高等传递现象，计算传热学
创业教育课：产品工程与创业实践（“三个一”课程）

Featured Courses:

Freshmen Seminars: Seminar for Freshmen in Chemistry

MOOC: computer aided design

Subject Frontiers Courses: Lectures of Chemistry and Chemical engineering Frontier

Baccalaureate-Master's Integrated Courses: Natural Gas Hydrate - Principle and Technology, Computational heat transfer, Principle of Advanced Transfer Process

Innovation Practice: Product Engineering and Entrepreneurship

Entrepreneurship Courses: Product Engineering and Entrepreneurship

一、各类课程学分登记表（Registration Form of Curriculum Credits）

学时 Academic Hours					学分 Credits						
总学时数 Total	其中 Include		其中 Include		总学分数 Total	其中 Include		其中 Include			其中 Include
	必修学时 Compulsory	选修学时 Elective	理论教学学时 Theory Course	实验教学学时 Lab		必修学分 Compulsory	选修学分 Elective	集中实践教学环节学分 Practice-concentrated Training	理论教学学分 Theory Course Credits	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2584	2072	512	1914	670	170	138	32	30	119	21	4

注：1.通识课计入选修一项中；

2.实验教学包括“专业教学计划表”中的实验、实习和其他；

3.创新创业教育学分：培养计划中的课程，由各学院教学指导委员会认定，包括竞教结合课程、创新实践课程、创业教育课程等学分；

4.必修学时＋选修学时=总学时数；理论教学学时＋实验教学学时=总学时数；必修学分＋选修学分=总学分数；集中实践教学环节学分＋理论教学学分＋实验教学学分=总学分数；

Note:

1. General education is included in the elective course;

2. Experimental teaching includes experiments, internships and others in the "Professional Teaching Plan".

3. Innovative entrepreneurship education credits: the courses in the training plan are determined by the teaching steering committees of colleges, including the credits of the course of combining competition with teaching, the course of innovative practice and the course of entrepreneurship education.

4. Compulsory hours + elective hours = total hours; theoretical teaching hours + experimental teaching hours = total hours; compulsory credits + elective credits = total credits; concentrated practical teaching link credits + theoretical teaching credits + experimental teaching credits = total credits;

二、课程设置表（Courses Schedule）

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	实验 Lab Hours	实习 Practice Hours	其他 Other Hours			
公共基础课 General Basic Courses	043100413	思想道德修养与法律基础 ideological and moral cultivation and fundamentals of law	必修课 C	40			4	2.5	1	
	031101371	中国近现代史纲要 Outline of Chinese Modern History		40			4	2.5	2	
	031101423	毛泽东思想和中国特色社会主义理论体系概论 Thought of Mao Zedong and Theory of Socialism with Chinese Characteristics		72			24	4.5	3	
	031101621	马克思主义基本原理概论 Fundamentals of Marxism Principle		40			4	2.5	4	
	031101331	形势与政策 Situation and Policy		128				2.0	1-8	
	040100591	微积分Ⅰ（一） Calculus (1)		80				5.0	1	
	040100662	微积分Ⅰ（二） Calculus (2)		64				4.0	2	
	040100401	线性代数与解析几何 Linear Algebra & Analytic Geometry		48				3.0	1	
	040100023	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	
	041100582	大学物理Ⅰ（一） University Physics 1		48				3.0	2	
	041101391	大学物理Ⅰ（二） University Physics 2		48				3.0	3	
	041100671	大学物理实验（一） University Physics Experiment 1		32	32			1.0	3	
	041101051	大学物理实验（二） University Physics Experiment 2		32	32			1.0	4	
	044103681	大学英语（一） University English(1)		48				3.0	1	
	044103691	大学英语（二） University English(2)		48				3.0	2	
	045101642	大学计算机基础 Fundamentals of Computer		32			32	1.0	1	
	045102811	Python 语言程序设计 Python Language Programming		40			8	2.0	1	
	074102163	工程制图 Engineering Drawing		48				3.0	2	

	052100332	体育（一） Physical Education (1)		32			32	1.0	1	
	052100012	体育（二） Physical Education (2)		32			32	1.0	2	
	052100842	体育（三） Physical Education (3)		32			32	1.0	3	
	052100062	体育（四） Physical Education (4)		32			32	1.0	4	
	036104461	无机化学 Inorganic Chemistry		40				2.5	1	
	047101161	无机化学实验（一） Experiment of Inorganic Chemistry I		16	16			0.5	1	
	047101201	无机化学实验（二） Experiment of Inorganic Chemistry II		16	16			0.5	2	
	006100112	军事理论 Military theory		36			18	2.0	2	
		人文科学领域[注 1] Humanities	通识课E	96				6.0		
		社会科学领域[注 2] Social Science		64				4.0		
	合　计 **Total**		C 通	1240 160	120		180	62.5 10		

备注：学时中其他可以为上机和实践学时。

注 1：要求每个学生修读 6 学分的人文科学课程，其中至少 1 门 2 学分以上的人文科学核心课程。

注 2：要求每个学生修读 4 学分的社会科学课程。

Note: Others hours in study can be online or practice hours

Note 1: Each student is required to take 6 credits of Humanities courses, of which at least one core humanities course with 2 credits or more is required.

Note 2: Each student is required to take a 4-credit course in social science.

二、课程设置表（续）（Courses Schedule, continued）

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	实验 Lab Hours	实习 Practice Hours	其他 Other Hours			
专业基础课 Specialty Basic Courses	037101791	有机化学 I Organic Chemistry I	C	48				3.0	3	
	037102571	有机化学实验 I Experiment of Organic Chemistry I		32	32			1.0	3	
	037102621	分析化学 II Analytical Chemistry		40				2.5	3	
	037102651	分析化学实验 II Analytical Chemistry Experiment II		32	32			1.0	3	
	037102581	物理化学 II Physical Chemistry II		64				4.0	3	
	037102001	物理化学实验 II Physical Chemistry Experiment II		32	32			1.0	3	
	047101531	电化学方法、原理和应用 Electrochemistry: Methodology, Principle and Application		32				2.0	5	
	034101782	电工与电子技术 I Electrical Engineering and Electrotechnics I		72	24			4.0	4	
	037100183	流体力学 Fluid Mechanics		48				3.0	3	
	037100641	传热学 Heat Transfer		48				3.0	4	
	037100271	传质与分离工程III Mass Transfer and Separation Processes		48				3.0	4	
	037100411	化工原理实验（一） Experiment of Chemical Engineering Principles (1)		16	16			0.5	3	
	037100202	化工原理实验（二） Experiment of Chemical Engineering Principles (2)		16	16			0.5	4	
	047101511	化工系统工程 Chemical System Engineering		40			8	2.0	5	
	037100353	工程热力学 Engineering Thermodynamics		48				3.0	4	

	03710073 1	化学反应工程 Chemical Reaction Engineering		48				3.0	5	
	04710154 1	热力学实验 Experiment of Thermodynamics		16	16			0.5	4	
	03710271 1	能源化工设计 Energy Chemical Design		32				2.0	7	
	04710146 1	燃烧学 Combustion theory		48				3.0	5	
	03710113 1	化工过程控制原理与仪表 Chemical Process Control Principle and Instrument		48	16			2.5	5	
	04710139 1	化工设备机械基础 Mechanical Fundamental of Chemical Engineering Equipment		32				2.0	6	
	04710142 1	产品工程与创业实践（“三个一”课程） Product Engineering and Entrepreneurship Practice ("Three in One" Course)		28	24			1.0	6	
	03710135 1	能源审计与管理 Energy Audit and Management		32				2.0	6	
	04710061 2	学科前沿讲座◎ Lectures of Chemistry and Chemical Engineering Frontier	E	32				2.0	2	
		化类新生研讨课 Seminar for Freshmen in Chemistry	E	16				1.0	2	
	合 计 Total		C	828	184			45.5		
			E	专业基础课要求选修 2 学分以上 Requirements for Basic Specialty Courses More than 2 Credits						
选修课 Elective	03710015 2	计算机辅助设计 Computer-aided Design	E	40			16	2.5	2	
	04510287 1	小白学人工智能 [注1] To learn Artificial Intelligence for Novice		40			40	2.0	7	

	03710122 1	化工设计导论 Introduction to Chemical Engineering Design		16				1.0	2	
	03710118 1	高效换热器原理与设计 High Efficiency Heat Exchanger: Principle and Design		32				2.0	5	
	03710269 1	能源化学工程概论 Introduction to Energy Chemical Engineering		32				2.0	2	
	04710152 1	天然气利用[注2] Natural Gas Utilization	能化工艺类课程E	48				3.0	5	
	03710057 2	石油加工[注2] Petroleum Processing		48				3.0	6	
	04710144 1	新能源技术与应用[注2] New Energy Technology and its Application		48				3.0	7	
	03710045 1	世界名企讲座 Lectures of Global Famous Enterprises	E	16				1.0	6	
	03710140 1	能源材料 Energy Materials		32				2.0	6	
	04710163 1	能源互联网与智慧能源 Energy Internet and Intelligent Energy		32				2.0	6	
	03710017 3	天然气输配[注3] Natural Gas Transmission and Distribution		32				2.0	6	

	04710158 1	储能技术及应用 Energy Storage and its Application		32				2.0	6	
	03710091 2	制冷与空调 Refrigeration and Air Conditioning		32				2.0	6	
	03710120 1	化工环境工程 Chemical Environmental Engineering		32				2.0	6	
	03710047 1	化工过程安全 Chemical Process Safety		32				2.0	6	
	03710098 1	化工技术经济学 Chemical Industry Technical Economy		32				2.0	6	
	03710131 1	工业催化 Industrial Catalysis		32				2.0	6	
	04710157 1	能源系统：多能互补与梯级利用 Energy System: Coupling and Cascade Utilization		32				2.0	6	
	04710155 1	化工过程模拟 Simulation of Chemical Process		32			8	2.0	6	
	04710159 1	天然气水合物原理与技术※ Natural Gas Hydrate: Principle and Technology	本研共	32				2.0	7	

	04710160 1	计算传热学※ Computational heat transfer	享 E	32				2.0	7	
	04710161 1	高等传递过程原理※ Principle of Advanced Transfer Process		48				3.0	7	
	04710147 1	绿色催化前沿技术与化工过程强化的应用与分析 Advance Technology of Green Catalysis in the Application and Analysis of Enhanced Chemical Process	选 E	32				2.0	7	
	04710148 1	能源化工系统集成创新和可持续性分析 Integration and Sustainability of the energy and chemical processes	选 E	32				2.0	7	
	04710149 1	化学化工学科前沿—美丽化工 Frontier of chemistry and chemical engineering-Beautiful Chemistry and chemical Engineering	选 E						6	
	02010005 1	创新研究训练 Innovation Research Training	选 E	32				2.0	7	
	02010004 1	创新研究实践 I Innovation Research Practice I		32				2.0	7	
	02010003 1	创新研究实践 II Innovation Research Practice II		32				2.0	7	
	02010006 1	创业实践 Entrepreneurial Practice		32				2.0	7	
	合 计 **Total**		选 E	选修课修读最低要求 20 学分 minimum elective course credits required: 20						

备注：学时中其他可以为上机和实践学时。

学生根据自己开展科研训练项目、学科竞赛、发表论文、获得专利和自主创业等情况申请折算为一定的专业选修课学分（创新研究训练、创新研究实践 I、创新研究实践 II、创业实践等创新创业课程）。每个学生累计申请为专业选修课总学分不超过 4 个学分。经学校批准认定为选修课学分的项目、竞赛等不再获得对

应第二课堂的创新学分。

课程名上◎标志为本专业毕业要求课程.

课程名上※标志为本研共享课程，供学有余力同学选修

注 1：小白学人工智能为 MOOC 课程，在第一、二、三学年的虚拟第 3 学期中完成。

注 2：学生需选定“天然气利用”、“石油加工”和“新能源技术与应用”中 1 门以上的“能化工艺类课程”

注 3：学生选“天然气输配”课程需同时选定“燃气输配课程设计”

Note: Others hours in study can be online or practice hours

According to their own scientific research training projects, subject competitions, publishing papers, obtaining patents and independent entrepreneurship, students apply for conversion to a certain professional elective course credits (innovation research training, innovation research practice I, innovation research practice II, entrepreneurship practice and other innovative entrepreneurship courses). Each student applies for a total of no more than 4 credits for professional elective courses. Items and competitions recognized as elective credits by the school will no longer receive innovative credits corresponding to the second classroom.

The sign on the title of the course is the required course for graduation of this major.

The sign on the title of the course is a shared course for students who have spare time to take.

Note 1: “To learn Artificial Intelligence for Novice” is MOOC type of course and open in summer vacation.

Note 2: Students need to choose more than one "Energy Technology" course.

Note 3: Students should choose "Gas Transport and Distribution Course Design" at the same time when they choose "Gas Transport and Distribution Course"

三、集中实践教学环节(Practice-concentrated Training)

课程代码 Course No	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours		学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
			实践 Practice weeks	授课 Lecture Hours			
006100151	军事技能 Military Technique	必 C	2 周		2.0	1	
031101551	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	3	
037100081	文献检索与实践 Literature Search and Practice	C	1 周		1.0	3	
047100702	化工原理课程设计 Course Project on Chemical Engineering Principle	C	2 周		2.0	4	
030100702	工程训练 I Engineering Training	C	2 周		2.0	4	
041101592	电子工艺实习 I Practice of Electronic Technology	C	1 周		1.0	5	
037102721	能源化工设计实训 Practice of Energy Chemical Engineering Design	C	2 周		2.0	7	
047101561	化工设备机械课程设计 Course Design of Chemical Equipment Machinery	C	1 周		1.0	6	
037101342	燃气输配课程设计[备注] Design Project on Gas Transmission and Distribution System	E	1 周		1.0	6	

047101621	能源化工专业实验 Integrated Experiment of Energy Chemical and Engineering	C	2 周		2.0	6	
047101301	认识实习 Field Visit	C	1 周		1.0	5	
037100311	生产实习 Production Practice	C	2 周		2.0	7	
037101301	仿真实习 Simulation Practice	C	2 周		2.0	8	
037100971	毕业设计（论文） Diploma Project (Thesis)	C	15 周		10.0	8	
合 计 Total		必 C	35 周		30		

备注：“燃气输配课程设计”安排在“天然气输配”课程后进行。

Note: The course design of gas transmission and distribution is arranged after the course of natural gas transmission and distribution.

四、第二课堂

第二课堂由人文素质教育和创新能力培养两部分组成。

1.人文素质教育基本要求

学生在取得专业教学计划规定学分的同时，还应结合自己的兴趣适当参加课外人文素质教育活动，参加活动的学分累计不少于 2 个学分。

2.创新能力培养基本要求

学生在取得本专业教学计划规定学分的同时，还必须参加国家创新创业训练计划、广东省创新创业训练计划、SRP（学生研究计划）、百步梯攀登计划或一定时间的各类课外创新能力培养活动（如学科竞赛、学术讲座等），参加活动的学分累计不少于 4 个学分。

4.“Second Classroom” Activities

“Second Classroom” Activities are comprised of two parts, Humanities Quality Education and Innovative Ability Cultivation.

1)Basic Requirements of Humanities Quality Education

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in extracurricular activities of Humanities Quality Education based on one’s interest, acquiring no less than two credits.

2)Basic Requirements of Innovative Ability Cultivation

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in any one of the following activities: National Undergraduate Training Programs for Innovation and Entrepreneurship, Guangdong Undergraduate Training Programs for Innovation and Entrepreneurship, Student

Research Program (SRP), One-hundred-steps Innovative Program, or any other extracurricular activities of Innovative Ability Cultivation that last a certain period of time (e.g. subject contests, academic lectures), acquiring no less than four credits.