资源环境科学

Resources and Environment Science

专业代码：082506T　　**学　制：**4 年

Program Code:082506T　　**Duration：4years**

培养目标：

培养德、智、体全面发展，具有数学、化学、化工、生物、高分子材料、能源与环境等学科基础理论知识，掌握植物纤维化学、生物质加工工程、资源利用与管理等相关专业知识，具有从事生物质炼制、生物质材料等相关领域的工程设计、生产管理、质量控制、研究开发等能力，兼具创新意识、团队精神、环保意识和职业素养的高级专门人才。

Educational Objectives:

The major of Resources and Environmental Science aims to cultivate undergraduates with all-rounded and high-quality who are able to gain background knowledge of mathematics, chemistry, chemical engineering, biology, polymer material, energy engineering and environment engineering as well as the professional knowledge of lignocellulosic chemistry, bioresource process engineering and resource utilization & management. On successful completion of this program, students will acquire the ability for conducting engineering design, production management, quality control and research & development in biorefinery, bioresource-based material and other related area, and are expected to be professionals with innovative awareness, teamwork spirit, awareness of environmental protection and occupational quality.

毕业要求：

№1.工程知识：掌握扎实的数学、化学、生物技术、高分子材料、环境科学，以及工程等方面的基础知识，以及生物质资源转化为能源、化学品和材料等方面的实际操作技能，具备相关环境生态处置能力，为解决生物质转化过程中的实际问题打下知识基础。

№2.问题分析：能够应用化学、生物技术、高分子材料等基础知识，以及资源利用与转化的基本原理、方法和手段，通过文献研究、分析实践和工业需求中遇到的问题，并获得有效结论。

№3.设计/开发解决方案：能够针对生物质资源转化中的复杂问题提出解决方案，设计满足特定需求的工艺流程或方法，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。

№4.研究：能够基于科学原理并采用科学方法对生物质资源转化中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。

№5.使用现代工具：能够针对生物质资源转化中的复杂问题，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，包括对转化中复杂问题的预测与模拟，并能够理解其局限性。

№6.工程与社会：让学生认识到掌握植物生物质资源转化为能源、化学品和材料、生物质利用

与环境生态的科学研究、工程设计和技术管理等能力，是实现制生物质工业设计和装备使用的重要组成部分，并使之服务于社会、服务于世界。

№7.环境和可持续发展：能够本专业及相关背景知识合理分析，并评价针对生物质资源转化实践中复杂问题对环境、社会可持续发展的影响。

№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。

№9.个人和团队：培养学生在资源与环境科学的工程实践团队中沟通与合作能力，具备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。

№10.沟通：能够就资源与环境科学工程中的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。

№11.项目管理：理解并掌握资源与环境科学工程管理原理与经济决策方法，并能在多学科环境中应用。

№12.终身学习：毕业生能够在环境友好材料，清洁能源，绿色化学品，环境工程及其相关领域从事相关的科学研究、工程技术、工程管理和企业管理等工作，具备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。

Student Outcomes:

№1. Engineering knowledge：know well about fundamentals of chemistry, chemical engineering and material, as well as the basic principles, methods related to Engineering of Pulp- and Paper-making. Through the basic training of such as experimental skills, engineering practice, computer application as well as scientific research and engineering design, students would know the basics about how to solve the complicated problems related to light industrial engineering.

№2. Problem analysis: obtain efficient conclusions by studying and analyzing complicated problems based on nature science, fundamentals, techniques, working knowledge of light chemistry industries, as well as organizing, expressing and literature retrieval.

№3. Design/develop solutions: Design and develop solutions for the complicated problems existing in light chemistry engineering; Design and develop solutions for material select, process design, equipment selects and plant design that suit for light chemistry engineering practice and industrial needs. Meanwhile, innovation is involved in the whole solutions, and society, health, security, laws, culture and environment must be considered.

№4. Research: be able to study complicated problems based on scientific principles and using scientific methods, including research plan, analyze and interpret data, draw efficient conclusions via summary of all results.

№5. Uses of modern tools: focusing on the problems rising from light chemical engineering, be able to specifically develop, choose suitable techniques, resources, modern engineering and information

technological tools, including prediction and simulation of the problems from light chemical engineering, and understandings of their limitation.

№6. Engineering and society: be able to know that the knowledge about conversion of biomass resources to energy, chemicals and materials, scientific studies of biomass utilizations and environmental ecology, engineering design and technological management plays the key role in the achievement of biomass industrial design and apparatus uses which will be also served for the society as well as the whole world.

№7. Environmental and sustainable development: be able to analyze reasonably the knowledge background related to the course, and evaluate the effects of complicated problems from the conversion practice of biomass resources to the environment and sustainable development of society.

№8. Professional norms: be able to have diathesis of humanity social science and social responsibility as well as abide by professional ethics and being responsibly in engineering practice.

№9. Individual and Team: improve the abilities of communication and collaboration to the players in the engineering practical team of resource and environmental science, and be able to take responsibility as roles of individual, team player and team leader in multi-disciplinary background.

№10. Communication: an ability to communicate effectively with scientists and social people on complex problems in resource and environmental scientific engineering, including report writing, draft design, speech, express and answer properly, as well as communicate in cross-cultural contexts with international perspective.

№11. Project Management: understand and know well about the principles and economic decision-making methods related to resource and environmental scientific engineering management, and work in multidisciplinary environments.

№12. Learn for life: engage in the work of scientific studies, engineering, engineering and enterprise management in the fields of environmental friendly materials, green energy and chemicals, environmental engineering and their related; have willingness of learning independently and for life; have abilities of continuously learning and adapt to new developments.

专业简介：

本专业是在国家级特色专业、省级名牌专业和重点建设专业——轻化工程专业（制浆造纸方向）基础上，结合植物纤维生物质正逐渐成为未来能源和材料的主要可再生资源的发展趋势、着眼于国家资源与环境发展战略、特别是顺应生物质资源综合利用科学发展需求而于 2004 年设置的，拥有以植物资源高效利用为特色的制浆造纸工程国家重点实验室、国家工程研究中心和国家级本科实验教学示范中心，师资力量雄厚，重视学生科学研究、工程实践和国际交流能力的培养，多年来致力于植物资源高值化利用及转化研究，研究成果在国内外相关领域产生了重要的影响，是我国可再生生物质资源领域最主要的科学研究和高层次人才培养的基地。

Program Profile：

This major was established in 2004. It based on the major of light chemical engineering (pulp and paper engineering direction) which is the national characteristic major, the excellent major and key major of Guangdong Province. It combined the developing trend of biomass being the renewable resources of energy and materials in the future, targeted the national development strategy on resources and environment as well as the needs of comprehensive utilization of bioresources. This major is supported by State Key Laboratory of Pulp and Paper Engineering, the National Engineering Research Center of Papermaking & Pollution Control and the National Experimental Teaching Demonstration Center focusing on the efficiently utilization of plant resources. The major has highly competitive faculty, and attaches importance to the cultivation of students' ability on scientific research, engineering practice and international communication. Have done a lot of research works of higher value applications and conversion of plant resources for mny years and made the important impacts in relative fields. This major has become a main base of scientific research and high-level talent cultivation in the field of renewable bioresources in our country.

专业特色：

在国家级特色专业基础上设立，具有化学、生物、材料等多学科交叉的新兴专业；以国家级实验研究平台为标志的一系列高水准科研教学平台和国际合作研究中心及院士领衔的师资队伍；培养国际化视野及综合能力突出的学生。

Program Features:

（1）Based on the national characteristic major, establish the multidisciplinary emerging major across chemistry, biology, material science etc.（2）A series of high-level research and teaching platforms as well as international cooperate research center represented by national experimental research platforms, and high-level faculty led by academician.（3）Cultivate students with international outlook and excellent comprehensive ability.

授予学位：工学学士学位

Degree Conferred: Bachelor of Engineering

主干课程：

有机化学、流体力学与传热、传质与分离工程、纤维素与多糖化学、木质素化学、环境化学、工业微生物学。

Core Courses:

Organic Chemistry, Fluid Mechanics and Heat Transfer, Mass Transfer and Separation Processes, Polymer Chemistry, Cellulose and polysaccharides chemistry, Lignin chemistry, Environmental Chemistry, Biorefinery Engineering Design, Industrial Microbiology, Biomass Process Engineering.

特色课程：

全英教学课程：生物质精炼概论

双语教学课程：植物纤维分离与转化工程

创业教育课程：生物质炼制产业发展及创新

Featured Courses：

Courses Taught in English: Introduction to Biorefining

Bilingual courses: Lignocellulose Separation and Conversion Engineering

Innovation Practice: Industry Development and Innovation of Biorefinery

一、教学计划总体安排表（General Teaching Schedule）

学年	学期	教学进度安排（周）																				理论教学	考试	入学教育	军训	课程设计	大作业	工程训练	电子实习	综合实验	社会实践	生产实习	毕业实习	其它实习	中外合作项目	毕业设计	就业安排	机动	假期	小计
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
一	1		C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	D	D	D	14	1	1	3																
	2	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	18	2																	
二	3	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Q	I	B	B	16	2							1							1		
	4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	G	G	B	B	16	2					2											
三	5	A	A	A	A	A	A	A	A	A	A	A	A	A	H	E	E	K	K	B	B	13	2			2			1			2							
	6	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	E	B	B	16	2			2													
四	7	A	A	A	A	A	A	L	L	L	A	A	A	Q	A	A	A	A	A	B	B	14	2										3					1		
	8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	P	P	P	Q	Q														15	3	2		
合计（周）																						107	13	1	3	4		2	1	1		2	3			15	3	4		159

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

1.学分统计表（Credits Registration Form）

课程类别 Course Category	课程要求 Requirement	学分 Credits	学时 Academic Hours	备注 Remarks
公共基础课 General Basic Courses	必修 Compulsory	60.0	924	
	通识 General Education	10.0	160	
学科基础课 Disciplinary Basic Courses	必修 Compulsory	43.0	800	
	选修 Elective	6.0	96	
专业领域课 Specialty- related Courses	必修 Compulsory	10.0	192	
	选修 Elective	8.0	128	
合　计 Total		137.0	2300	
集中实践教学环节（周） Practice Training (Weeks)	必修 Compulsory	35.0	35 周	
毕业学分要求 Credits Required for Graduation	137.0+35.0=172.0			

备注：学生在取得专业教学计划规定学分的同时，还必须取得第二课堂 2 个人文素质教育学分和 4 个创新能力培养学分。

2.类别统计表（Category Registration Form）

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
2300	1916	384	1812	488	172	148	24	35	121.5	15.5	5

三、专业教学计划表（Teaching 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	上机 Computer-aided Class Hours	实验 Lab Hours	实践 Practice Hours			
公共基础课 General Basic Courses	143093	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law	必修课 C	(48) (36)				2.5	1	№8
	143106	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		(96) 48				5.0	3	№7,8
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	2	№8
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(48) 36				2.5	4	№8
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	1-8	№8
	144001	大学英语（一） College English(1)		64				4.0	1	№10
	144002	大学英语（二） College English(2)		64				4.0	2	№10
	145223	大学计算机基础 Foundations of Computer		32				2.0	1	№1,5
	152001	体育（一） Physical Education(1)		32			32	1.0	1	№12
	152002	体育（二） Physical Education(2)		32			32	1.0	2	№12
	152003	体育（三） Physical Education(3)		32			32	1.0	3	№12
	152004	体育（四） Physical Education(4)		32			32	1.0	4	№2
	106001	军事理论 Military Principle		(16)				1.0	2	№9
	140189	微积分Ⅰ（一） Calculus(1)		80				5.0	1	№1
	140190	微积分Ⅰ（二） Calculus(2)		64				4.0	2	№1
	140197	线性代数与解析几何 Linear Algebra & Analytic Geometry		48				3.0	1	№1
	140019	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	№1
	130139	工程制图（一） Engineering Drawing(1)		48				3.0	1	№5
	130140	工程制图（二） Engineering Drawing(2)		32				2.0	2	№5
	141001	大学物理Ⅰ（一） General Physics (1)		48				3.0	2	№1
	141002	大学物理Ⅰ（二） General Physics (2)		48				3.0	3	№1
	141007	大学物理实验（一） Physics Experiment(1)		32		32		1.0	2	№2,4
	141008	大学物理实验（二） Physics Experiment(2)		32		32		1.0	3	№2,4
	145268	C++程序设计基础 C++ Programming Foundations		48				3.0	2	№5
		人文科学领域 Humanities	通识课 E	96				6.0		№8
		社会科学领域 Social Science		64				4.0		№8

	合　计 **Total**			1084		64	128	70.0		
学科基础课 Disciplinary Basic Courses	147001	无机化学Ⅰ Inorganic Chemistry	必C	32				2.0	1	№1
	147034	无机化学实验（工科）（一） Experiment of Inorganic Chemistry(1)	必C	16		16		0.5	1	№2,4
	147035	无机化学实验（工科）（二） Experiment of Inorganic Chemistry(2)	必C	16		16		0.5	2	№2,4
	147021	有机化学Ⅱ Organic Chemistry	必C	64				4.0	2	№1
	147016	有机化学实验Ⅱ Organic Chemistry Experiments	必C	48		48		1.5	3	№2,4
	147008	分析化学Ⅰ Analytical Chemistry	必C	32				2.0	3	№1
	147010	分析化学实验Ⅰ Analytical Chemistry Experiment	必C	16		16		0.5	3	№2,4
	147058	物理化学Ⅰ Physical Chemistry	必C	48				3.0	4	№1
	147055	物理化学实验Ⅱ Physical Chemistry Experiment	必C	32		32		1.0	4	№2,4
	135092	电工与电子技术Ⅱ Electrical Engineering and Electrontechnics	必C	64				4.0	4	№1
	135081	电工与电子技术实验 Experiment of Electrical Electrontechnics Engineering	必C	24		24		1.0	5	№2,4
	130083	机械设计基础 Basis of Mechanical Design	必C	48				3.0	5	№1
	130311	机械基础综合实验Ⅱ Poly-experiment of Mechanical Fundamentals	必C	16		16		0.5	5	№2
	137036	流体力学与传热Ⅲ Fluid Mechanics and Heat Transfer	必C	56				3.5	5	№1
	170013	传质与分离工程Ⅲ Mass Transfer and Separation Processes	必C	48				3.0	6	№1
	137063	化工原理实验（一） Experiment of Chemical Engineering Principles(1)	必C	16		16		0.5	5	№2,4
	137064	化工原理实验（二） Experiment of Chemical Engineering Principles(2)	必C	16		16		0.5	6	№2,4
	133091	工程力学Ⅰ Engineering Mechanics	必C	48				3.0	4	№1
	138089	纤维素与多糖化学（一） Cellulose and Polysaccharide chemistry I	必C	32				2.0	4	№3
	138090	纤维素与多糖化学（二） Cellulose and polysaccharides chemistry Ⅱ	必C	32				2.0	5	№3
	138001	植物纤维化学实验 Experiment of Lignocellulosic Chemistry	必C	32		32		1.0	4	№2,4
	138092	木质素化学 Lignin chemistry	必C	32				2.0	4	№.3
	138091	环境化学 Environmental Chemistry	必C	32				2.0	3	№3,7,12
	138069	高分子化学 Polymer Chemistry	选E	32				2.0	4	№3
	138070	高分子化学实验 Experiment of Polymer Chemistry	选E	32		32		1.0	4	№2
	138093	酶学基础与应用 Fundamentals and Applications of Enzymology	选E	32				2.0	6	№3

	138072	高分子物理 Physics of Macromolecules	选 E	32				2.0	6	№3
	138027	天然产物化学 Natural Products Chemistry	选 E	32				2.0	7	№3
	138083	文献检索与科技论文写作 Literature retrieval and academic paper writing	选 E	24				1.5	3	№2,10
	合 计 Total		必 C	800		232		43.0		
			选 E	选修课修读最低要求 6.0 学分 minimum elective course credits required:6.0						
专业领域课 Specialty- related Courses	138028	工业微生物学 Industrial Microbiology	必 C	32				2.0	5	№1,3
	170170	工业微生物学实验 Experiment of Industrial Microbiology	必 C	32		32		1.0	5	№2,3,4
	138095	生物质组分分离与转化技术实验 Experiments on Separation of Biomass Components and Conversion	必 C	32		32		1.0	6	№2,4
	138096	生物质炼制工程设计 Biorefinery Engineering Design	必 C	32				2.0	6	№4,5,6
	138097	植物生物质科学导论（一） Introduction to Plant Biomass Science（I）	必 C	16				1.0	1	№1
	138098	植物生物质科学导论（二） Introduction to Plant Biomass Science（Ⅱ）	必 C	16				1.0	3	№1
	138077	环境工程概论 Introduction to Environmental Engineering	必 C	32				2.0	7	№1,3,7,12
	138099	生物质材料与化学品 Biomass-based Materials and Chemicals	选 E	32				2.0	5	№4,7
		生物质能源原理与工程 Biomass Based Energy Principles and Engineering	选 E	32				2.0	6	№4,7
	138100	生物质加工工程 Biomass Process Engineering	选 E	32				2.0	7	№4,7
	139107	生物质精炼概论 Introduction to Biorefining	选 E	24				1.5	5	№7,10
	138101	植物纤维分离与转化工程 Lignocellulose Separation and Conversion Engineering	选 E	16				1.0	6	№4,10
	138086	实验设计及数据分析 Experimental Design and Data Analysis	选 E	16				1.0	3	№4
		环境检测原理与实践 Environmental monitoring principle and practice	选 E	16				1.0	6	№3,7,12
	138102	生物质炼制产业发展及创新 Industry Development and Innovation of Biorefinery	选 E	16				1.0	7	№3,9,11
	120003	创新研究训练 Innovation Research Training	选 E	32				2.0		№3,4,9
	120004	创新研究实践 I Innovation Research Practice 1	选 E	32				2.0		№3,4,9
	120005	创新研究实践 II Innovation Research Practice 2	选 E	32				2.0		№3,4,9
	120006	创业实践 Entrepreneurial Practice	选 E	32				2.0		№3,4,9
	合 计 Total		必 C	192		64		10.0		
			选 E	选修课修读最低要求 8.0 学分 minimum elective course credits required: 8.0						

备注：1.本专业学生通选课需选修企业管理类及经济类课程各一门；2.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。3.本专业学生需选修本专业开设的双语课程和全英课程中的两门。

四、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			
106002	军训 Military Training	必 C	3 周		3.0	1	№9
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	№8,12
130195	机械设计基础课程设计 Course Project of the Basis of Mechanical Design	必 C	2 周		2.0	5	№3
147076	化工原理课程设计 Course Design for Chemical Engineering Principles	必 C	2 周		2.0	6	№2,3,6
141075	电子工艺实习Ⅰ Practice of Electronic	必 C	1 周		1.0	5	№3
130356	工程训练Ⅰ Engineering Training	必 C	2 周		2.0	4	№3
139062	生产实习 Production Practice	必 C	2 周		2.0	5	№9,10
139064	毕业实习 Graduation Practice	必 C	4 周		4.0	7	№9,10
139066	毕业设计（论文） Graduation Design（Paper）	必 C	15 周		15.0	8	№3,6,11
138087	认知实习 Cognitive Practice	必 C	1 周		1.0	1	№9
138088	科学实验规范及安全 Science Experiment Specification and Safety	必 C	1 周		1.0	3	№3,8,12
合 计 Total		必 C	35 周		35.0		

五、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或广东省创新创业训练计划或 SRP（学生研究计划）或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。

5. “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.

附：毕业要求实现矩阵

Enclosed: Realization Matrix for Student Outcomes

毕业要求 **Requirement for Graduation**	**知识与能力要求** **Knowledge and capability Requirement**	**关联矩阵（实现方式）** **Incidence matrix (Realization way)**
1.工程知识 №1. Engineering knowledge	掌握扎实的数学、化学、生物技术、高分子材料、环境科学，以及工程等方面的基础知识，以及生物质资源转化为能源、化学品和材料等方面的实际操作技能，具备相关环境生态处置能力，为解决生物质转化过程中的实际问题打下知识基础。 Know well about fundamentals of chemistry, chemical engineering and material, as well as the basic principles, methods related to Engineering of Pulp- and Paper-making. Through the basic training of such as experimental skills, engineering practice, computer application as well as scientific research and engineering design, students would know the basics about how to solve the complicated	大学计算机基础，微积分Ⅰ（一）（二），线性代数与解析几何，概率论与数理统计，大学物理Ⅰ（一）（二），无机化学Ⅰ，有机化学Ⅱ，分析化学Ⅰ，物理化学Ⅰ，电工与电子技术Ⅱ，机械设计基础，流体力学与传热Ⅲ，传质与分离工程Ⅲ，工程力学Ⅰ，工业微生物学，生物质组分分离与转化技术实验，植物生物质科学导论（一）（二），环境工程概论 Foundations of Computer, Calculus(1)(2), Linear Algebra & Analytic Geometry, Probability & Mathematical Statistics,

	problems related to light industrial engineering.	General Physics (1)(2), Inorganic Chemistry, Organic Chemistry, Analytical Chemistry, Physical Chemistry, Electrical Engineering and Electrontechnics, Basis of Mechanical Design, Fluid Mechanics and Heat Transfer, Mass Transfer and Separation Processes, Engineering Mechanics, Industrial Microbiology, Experiments on Separation of Biomass Components and Conversion，Introduction to Plant Biomass Science（Ⅰ）（Ⅱ）, Introduction to Environmental Engineering
2.问题分析 №2. Problem analysis	能够应用化学、生物技术、高分子材料等基础知识，以及资源利用与转化的基本原理、方法和手段，通过文献研究、分析实践和工业需求中遇到的问题，并获得有效结论。 Obtain efficient conclusions by studying and analyzing complicated problems based on nature science, fundamentals, techniques, working knowledges of light chemistry industries, as well as organizing, expressing and literature retrieval.	大学物理实验（一）（二），无机化学实验（工科）（一）（二），有机化学实验Ⅱ，分析化学实验Ⅰ，物理化学实验Ⅱ，电工与电子技术实验，机械基础综合实验Ⅱ，化工原理实验（一）（二），植物纤维化学实验，高分子化学实验，文献检索与科技论文写作，工业微生物学实验，生物质组分分离与转化技术实验，化工原理课程设计 Physics Experiment(1)（2）, Experiment of Inorganic Chemistry(1)（2）, Organic Chemistry Experiments, Analytical Chemistry Experiment，Physical Chemistry Experiment, Experiment of Electrical Electrontechnics Engineering, Poly-experiment of Mechanical Fundamentals, Experiment of Chemical Engineering Principles(1)（2）, Experiment of Lignocellulosic Chemistry, Experiment of Polymer Chemistry, Literature retrieval and academic paper writing, Experiment of Industrial Microbiology, Experiments on Separation of Biomass Components and Conversion, Course Design for Chemical Engineering Principles
3.设计/开发解决方案 №3. Design/develop solutions	能够针对生物质资源转化中的复杂问题提出解决方案，设计满足特定需求的工艺流程或方法，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。 Design and develop solutions for the complicated	人文科学领域，社会科学领域，纤维素与多糖化学（一）（二），木质素化学，环境化学，高分子化学，酶学基础与应用，高分子物理，天然产物化学，工业微生物学，工业微生物学实验，环境工程概论，环

	problems existing in light chemistry engineering; Design and develop solutions for material select, process design, equipment selects and plant design that suit for light chemistry engineering practice and industrial needs. Meanwhile, innovation is involved in the whole solutions, and society, health, security, laws, culture and environment must be considered.	境检测原理与实践，创新研究训练，创新研究实践Ⅰ Ⅱ，创业实践，机械设计基础课程设计，化工原理课程设计，电子工艺实习Ⅰ，工程训练Ⅰ，毕业设计（论文），科学实验规范及安全 Humanities，Social Science, Cellulose and polysaccharides chemistry（1）(2), Lignin chemistry ， Environmental Chemistry, Polymer Chemistry, Fundamentals and Applications of Enzymology, Physics of Macromolecules, Natural Products Chemistry, Industrial Microbiology, Experiment of Industrial Microbiology, Introduction to Environmental Engineering, Innovation Research Training，Innovation Research Practice（1）(2), Entrepreneurial Practice, Course Project of the Basis of Mechanical Design, Course Design for Chemical Engineering Principles, Engineering Training, Practice of Electronic, Graduation Design（Paper）, Science Experiment Specification and Safety, Environmental monitoring principle and practice
4.研究 №4. Research	能够基于科学原理并采用科学方法对生物质资源转化中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。 Be able to study complicated problems based on scientific principles and using scientific methods, including research plan, analyze and interpret data, draw efficient conclusions via summary of all results.	大学物理实验（一）（二），无机化学实验（工科）（一）（二），有机化学实验Ⅱ，分析化学实验Ⅰ，物理化学实验Ⅱ，电工与电子技术实验，化工原理实验（一）（二），植物纤维化学实验，工业微生物学实验，生物质组分分离与转化技术实验，生物质炼制工程设计，生物质材料与化学品，生物质能源原理与工程，生物质加工工程，植物纤维分离与转化工程（双语），实验设计及数据分析，创新研究训练，创新研究实践Ⅰ Ⅱ，创业实践 Physics Experiment(1)(2), Experiment of Inorganic Chemistry(1)(2), Organic Chemistry Experiments, Analytical Chemistry Experiment, Physical Chemistry Experiment, Experiment of Electrical Electrontechnics Engineering, Experiment of Chemical Engineering Principles(1)（2）, Experiment of Lignocellulosic Chemistry，Experiment of

		Industrial Microbiology, Experiments on Separation of Biomass Components and Conversion, Biorefinery Engineering Design, Biomass-based Materials and Chemicals, Biomass Based Energy Principles and Engineering, Biomass Process Engineering, Lignocellulose Separation and Conversion Engineering, Experimental Design and Data Analysis, Innovation Research Training, Innovation Research Practice（1）(2), Entrepreneurial Practice
5.使用现代工具 №5. Uses of modern tools	能够针对生物质资源转化中的复杂问题，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，包括对转化中复杂问题的预测与模拟，并能够理解其局限性。 Focusing on the problems rising from light chemical engineering, be able to specifically develop, choose suitable techniques, resources, modern engineering and information technological tools, including prediction and simulation of the problems from light chemical engineering, and understandings of their limitation.	大学计算机基础，工程制图（一）（二），C++程序设计基础，生物质炼制工程设计 Foundations of Computer, Engineering Drawing(1)（2）, C++ Programming Foundations, Biorefinery Engineering Design
6.工程与社会 №6. Engineering and society	让学生认识到掌握植物生物质资源转化为能源、化学品和材料、生物质利用与环境生态的科学研究、工程设计和技术管理等能力，是实现制生物质工业设计和装备使用的重要组成部分，并使之服务于社会、服务于世界。 Be able to know that the knowledge about conversion of biomass resources to energy, chemicals and materials, scientific studies of biomass utilizations and environmental ecology, engineering design and technological management plays the key role in the achievement of biomass industrial design and apparatus uses which will be also served for the society as well as the whole world.	人文科学领域，社会科学领域，生物质炼制工程设计，生物质炼制产业发展及创新，化工原理课程设计，毕业设计（论文） Humanities，Social Science, Biorefinery Engineering Design, Industry Development and Innovation of Biorefinery, Course Design for Chemical Engineering Principles, Graduation Design（Paper）
7.环境和可持续发展 №7. Environmental and sustainable development	能够本专业及相关背景知识合理分析，并评价针对生物质资源转化实践中复杂问题对环境、社会可持续发展的影响。 Be able to analyze reasonably the knowledge background related to the course, and evaluate the effects of complicated problems from the conversion practice of biomass resources to the	毛泽东思想和中国特色社会主义理论体系概论，环境化学，环境工程概论，生物质材料与化学品，生物质能源原理与工程，生物质加工工程，生物质精炼概论，环境检测原理与实践 Thought of Mao ZeDong and Theory of

	environment and sustainable development of society.	Socialism with Chinese Characteristics, Environmental Chemistry, Introduction to Environmental Engineering, Biomass-based Materials and Chemicals, Biomass Based Energy Principles and Engineering, Biomass Process Engineering, Introduction to Biorefining, Environmental monitoring principle and practice
8.职业规范 №8. Professional norms	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。 Be able to have diathesis of humanity social science and social responsibility as well as abide by professional ethics and being responsibly in engineering practice.	思想道德修养与法律基础，毛泽东思想和中国特色社会主义理论体系概论，中国近现代史纲要，马克思主义基本原理，形势与政策，人文科学领域，社会科学领域，马克思主义理论与实践，科学实验规范及安全 Cultivation of Thought and Morals & Fundamental of Law, Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics, Skeleton of Chinese Modern History, Fundamentals of Marxism Principle, Analysis of the Situation & Policy, Humanities, Social Science, Marxism Theory and Practice, Science Experiment Specification and Safety
9.个人和团队 №9. Individual and Team	培养学生在资源与环境科学的工程实践团队中沟通与合作能力，具备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。 Improve the abilities of communication and collaboration to the players in the engineering practical team of resource and environmental science, and be able to take responsibility as roles of individual, team player and team leader in multi-disciplinary background.	生物质炼制产业发展及创新，军事理论，创新研究训练，创新研究实践Ⅰ Ⅱ，创业实践，军训，生产实习，毕业实习，认知实习 Industry Development and Innovation of Biorefinery, Military Principle, Innovation Research Training, Innovation Research Practice 1 2, Entrepreeurial Practice, Military Training, Production Practice, Graduation Practice, Graduation Disign（Paper）
10.沟通 №10. Communication	能够就资源与环境科学工程中的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。 An ability to communicate effectively with scientists and social people on complex problems in	大学英语（一）（二），文献检索与科技论文写作，生物质精炼概论，植物纤维分离与转化工程，生产实习，毕业实习 College English(1)(2), Literature retrieval and academic paper writing, Introduction to

	resource and environmental scientific engineering, including report writing, draft design, speech, express and answer properly, as well as communicate in cross-cultural contexts with international perspective.	Biorefining, Lignocellulose Separation and Conversion Engineering, Production Practice, Graduation Practice
11.项目管理 №11. Project Management	理解并掌握资源与环境科学工程管理原理与经济决策方法，并能在多学科环境中应用。 Understand and know well about the principles and economic decision-making methods related to resource and environmental scientific engineering management, and work in multidisciplinary environments.	人文科学领域，社会科学领域，生物质炼制产业发展及创新，毕业设计（论文） Humanities, Social Science, Industry Development and Innovation of Biorefinery, Graduation Disign（Paper）
12.终身学习 №12. Learn for life	毕业生能够在环境友好材料，清洁能源，绿色化学品，环境工程及其相关领域从事相关的科学研究、工程技术、工程管理和企业管理等工作，具备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。 Engage in the work of scientific studies, engineering, engineering and enterprise management in the fields of environmental friendly materials, green energy and chemicals, environmental engineering and their related; have willingness of learning independently and for life; have abilities of continuously learning and adapt to new developments.	体育（一）（二）（三）（四），人文科学领域，社会科学领域，环境化学，环境工程概论，环境检测原理与实践，马克思主义理论与实践，科学实验规范及安全 Physical Education(1) (2) (3) (4), Humanities, Social Science, Environmental Chemistry, Introduction to Environmental Engineering, Environmental monitoring principle and practice, Marxism Theory and Practice, Science Experiment Specification and Safety