

制药工程专业培养方案

Undergraduate Program of Pharmaceutical Engineering Specialty

I.专业介绍 Introduction

西南交通大学制药工程专业设立于 2002 年，是学校生命板块和四大行动计划重点建设的本科专业，2013 年入选四川省卓越工程师教育培养计划，隶属于生命科学与工程学院药理学系。该专业 2002 年开始全国招生，为全日制本科，学制 4 年，授予工学学士。目前，本专业每年招生约 120 人，现有在校生约 480 人。截止 2020 年，累计毕业学生人数逾 1500 人，主要分布在四川及西南各省，为四川地方经济和制药工程相关产业发展做出了卓越贡献。

本专业拥有一支高水平、高素质的教师队伍。目前专任教师 78 人，具有高级职称 37 人，其中双聘院士 1 人，教育部“长江学者”1 人，国家杰出青年基金获得者 1 人，中组部第一批“青年千人计划”1 人，国家药典委员会委员 1 人，教育部新世纪（跨世纪）人才 1 人，四川省“青年千人计划”2 人。83%的教师具有博士学位，58%的教师具有国外学习或工作的经历。

该专业通过深度嵌入制药企业药品科研开发、制药生产和管理实践训练，培养以药学、化学和工程学为基础，掌握中药制药、化学制药及生物制药的基本理论、基本知识和基本技能，能够在医药、精细化工和生物化工等部门从事医药产品的生产、科技开发、应用研究和经营管理等方面的工程技术人才。

Pharmaceutical Engineering specialty of Southwest Jiaotong University (SWJTU) was established in 2002, which is an undergraduate program under key construction by both the life science section of school and the “Four Action Plans”. The Pharmaceutical Engineering was selected to be an "Excellent Engineers Education and Training Program" of Sichuan Province in 2013, and it is affiliated to the department of Pharmacy, School of Life Sciences and Engineering. The specialty began enrolling students nationwide in 2002. This undergraduate program needs four years of full-time study and the graduates are endowed with a bachelor's degree in engineering. At present, the program enrolls about 120 students each year, and currently has about 480 students. By 2020, the cumulative number of graduate students exceeds 1,500, who mainly distributed in Sichuan and southwestern provinces, which has made outstanding contributions to the development of Sichuan local economic and pharmaceutical engineering related industries.

There is a high-level and high-quality teaching team for this program (including 78 full-time teachers, half of which ever studied or worked overseas). Among them, there are 37 associate professors and professors, 1 academician who is employed by two or more institutions at the same time, 1 winner of the Distinguished Professors of the “Cheung Kong Scholars” Program and the National Science Fund for Distinguished Young Scholars Program, 1 winner of the first batch of "Thousand Youth Talent Program" of the Organization Department of the Central Committee, 1 member of the National Pharmacopoeia Commission, 1 member of the Ministry of Education talent in the new century (cross-century), 2 winners of “Thousand Youth Talents Program” of Sichuan Province, and 83% doctoral degree holders, 58% teachers with oversea experience.

This specialty cultivates engineering and technical talents who are capable of mastering the basic theories, knowledge and skills of traditional Chinese medicines, chemical pharmaceuticals and biopharmaceuticals, and engaging in the production, technological development, applied research and management of pharmaceutical products in the pharmaceutical, fine chemical and biochemical industries, based on study of chemistry, engineering and pharmacy, through deeply embedding in drug research and development, pharmaceutical production and management practice training in pharmaceutical enterprises.

专业代码: 081302

Program Code: 081302

专业名称: 制药工程

Program Name: Pharmaceutical Engineering

II.培养目标 Objectives

本专业培养德、智、体、美、劳全面发展的制药领域工程科技人才,具有较高的思想道德素质、人文素质、业务素质和身心素质以及创新思维、国际视野,具备药品研发、工程设计、技术实施、生产运行和管理的基本素养和能力。能在制药企业、医疗保健等行业从事制药科学研究、产品和工艺开发、工程设计、企业生产和质量管理等工作,并成为所在单位的技术或管理骨干。

毕业生经过 5 年的工作,能够达到下列目标:

培养目标 1: 能够综合运用制药工程专业的理论和技术手段,借助现代工程与信息科学技术工具,能够有效地分析、解决药品制造过程中的复杂工程问题。

培养目标 2: 具备与同行业及相关专业人员的沟通交流、组织管理能力,能够主导、协调或融入制药工程项目的设计和组织实施过程,并发挥骨干的作用。

培养目标 3: 具备更宽的国际视野,人文社会科学素养和社会责任感,能够在工作实践中遵守相关的行业法规和道德规范。

培养目标 4: 自主学习和终身学习的意识与能力进一步提高,专业素养进一步增强,适应行业发展需求。

This major trains engineering, scientific and technological talents in the pharmaceutical field with full development in morality, wisdom, physique and aesthetics, and also with superior ideological, moral quality, humanistic quality, professional quality, physical and mental quality. Then they can engage in pharmaceutical scientific research, product and process development, engineering design, enterprise production and quality management in pharmaceutical companies, health care and other industries, and become the technical or management backbone of their working department.

After 5 years of work, graduates can achieve the following goals:

Training Objective 1: The graduates can comprehensively use the theoretical and technical means of the pharmaceutical engineering profession, with the help of modern engineering and

information technology tools, to analyze and solve complex engineering problems in drug manufacturing.

Training Objective 2: The graduates should possess the ability of communication and management with related industry and professionals, and be able to lead, coordinate or integrate into the design and implementation of pharmaceutical engineering projects, and play the role of backbone.

Training Objective 3: The graduates should have a wider professional and international perspective, possess good humanities, social sciences literacy and high sense of social responsibility, they should also have ability to comply with relevant industry regulations and ethics in working practice.

Training Objective 4: The graduates of consciousness and ability of independent learning and lifelong learning will be further improved, and professional quality will be further enhanced to meet the needs of industry development.

III. 专业毕业要求 Graduation Requirements

经过 4 年本科阶段的培养，毕业生应在“知识、能力、素养”方面达到以下要求：

1. 工程知识：能够将数学、自然科学、工程基础和制药专业知识，应用于制药过程中复杂问题的求解、建模、分析与方案比较。

1.1 能够运用数学、自然科学及药学等基本知识和方法形成对制药过程中复杂问题的建立和比较。

1.2 能够运用数学、化学及工程基础等相关知识针对制药过程中的复杂问题建立合适的数学模型并求解。

1.3 能够将数学、化学及工程基础等相关知识和数学模型方法用于制药过程中复杂问题的推演和分析。

1.4 能够将制药工程相关知识和数学模型方法用于制药过程中复杂问题解决方案的比较与综合分析。

2. 问题分析：能够综合应用数学、自然科学和制药工程的基本原理，结合文献，识别、表达并分析复杂制药工程问题，证实解决方案的合理性，并获得有效结论。

2.1 能够运用数学、自然科学等基础知识和基本原理，识别和判断复杂制药工程问题的关键环节。

2.2 能够基于自然科学及制药工程的基础知识、基本原理和数学模型正确表达复杂制药工程问题。

2.3 能够基于自然科学及制药工程的基础知识、基本原理和文献研究，提供多种解决方案。

2.4 能够运用制药工程基础知识和基本原理，借助文献研究，分析药物生产过程中的影响因素，获得有效结论。

3. 设计/开发解决方案：针对复杂制药工程问题，能够综合运用制药工程专业知识，设计满足特定需求的系统或工艺流程，开发相应的解决方案，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 掌握药物生产工艺流程设计的基本方法，了解影响制药工程设计目标和技术方案的

因素。

3.2 能够针对解决制药工程复杂问题的特定需求，完成原料药生产及制剂等相关单元的设计。

3.3 能够针对药物设计和生产的需求，设计开发制药单元及工艺流程，采用图纸、设计说明书等形式呈现设计结果，体现创新意识。

3.4 能够在制药单元、工艺流程和药物开发与设计中综合考虑社会、健康、安全、法律、文化以及环境等因素。

4.研究：能够基于科学原理和专业知​识，采用科学方法对复杂制药工程问题进行研究，具备实验设计、实验实施、产品检测、数据分析的能力，并综合相关信息得到合理有效的结论。

4.1 能够采用正确的实验方法合成、分析和鉴定药物，熟悉药品物理化学性质的测定方法。

4.2 能够基于制药工程专业理论，根据具体的药物制备过程，对研究路线及实验方案进行设计及判断。

4.3 能够选用或搭建实验装置，采用科学合理的实验方法，安全地开展实验。

4.4 能够正确采集及整理实验数据，对实验数据进行关联，分析和解释，通过信息综合得到合理有效的结论。

5.使用现代工具：能够针对复杂制药工程问题，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，包括对复杂制药工程问题的预测与模拟，并能够理解其局限性。

5.1 知晓常用现代仪器和制图工具的使用原理，掌握信息检索工具和专业数据库的使用方法。

5.2 能够选择与使用恰当的制药工程相关软件进行制药工艺设计、工艺流程优化和设备选型等。

5.3 能够针对具体的制药过程和药品设计，借助制药专业相关软件，预测和模拟制药专业问题，并理解其局限性。

6.工程与社会：了解药物生产、设计、研发环节相关的法律、法规，基于专业知识，能够对工程实施方案进行合理分析，评价制药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 知晓药物生产、设计、研究与开发等方面的技术标准、法律法规和管理体系。

6.2 能够识别和分析药物新产品、新技术、新工艺的应用对社会、健康、安全、法律以及文化的相互影响，并理解其应承担的责任。

7.环境和可持续发展：能正确理解和评价针对复杂制药工程问题的工程实践对环境、社会可持续发展的影响。

7.1 能够知晓环境保护的相关法律法规，理解药物生产活动对环境和社会可持续发展的影响。

7.2 能够站在环境保护与社会可持续发展的角度，客观评估制药设计与生产过程中资源利用率和生产安全防范措施等对人类和环境造成损害的隐患。

8.职业规范: 具有人文社会科学素养、社会责任感, 树立和践行社会主义核心价值观, 能够在制药工程实践中爱岗敬业、诚信友善, 理解和遵守工程职业道德和规范, 履行责任。

8.1 树立和践行社会主义核心价值观, 理解社会主义价值体系, 了解历史、国情和形势政策。

8.2 理解制药工程职业道德和规范, 诚实公正, 诚信守则, 并能在工程实践中自觉遵守。

8.3 具备良好的社会责任感, 切实理解并履行制药工程师对公众安全、健康和福祉、环境保护以及可持续发展的义务与责任。

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, 并理解每个角色的定位与责任。

9.1 能够与团队其他学科的成员进行有效的沟通交流, 合作共事。

9.2 能在团队中承担领导或组员等不同角色独立或合作开展工作。

10.沟通: 能够熟练运用制药专业术语就复杂制药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 能够就制药专业问题, 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 知晓制药专业领域的国际发展趋势和研究热点, 理解和尊重全球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: 理解并掌握制药工程管理的原理和经济决策方法, 并能在多学科环境中, 在药物设计开发、生产过程中运用工程管理和经济决策方法中应用。

11.1 理解制药工程管理及经济相关基础知识, 知晓药品生产经济核算相关内容, 理解其中涉及的经济决策和生产管理相关内容。

11.2 在多学科环境下, 能够将工程管理与决策方法应用于项目管理、药物设计与产品开发。

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, 身心健康。

12.1 能在社会大背景下, 认识到自主学习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。

Graduation Requirements

After 4 years of undergraduate training, the graduates should meet the following requirements in terms of knowledge, abilities and qualities:

1. Engineering knowledge: having the ability to apply mathematics, natural science, engineering foundations, and pharmaceutical engineering professional knowledge to the solution, modeling, analysis, and program comparison of complex problems in the pharmaceutical process.

1.1 Having the ability to use basic knowledge and methods of mathematics, natural sciences and pharmacy to establish and compare complex problems in the pharmaceutical process.

1.2 Having the ability to use mathematics, chemistry and engineering basics as well as other relevant knowledge to establish suitable mathematical models for complex problems and solve them in the pharmaceutical process.

1.3 Having the ability to apply mathematics, chemistry, engineering basics and other relevant knowledge as well as mathematical modelling methods to the deduction and analysis of complex problems in the pharmaceutical process.

1.4 Having the ability to use pharmaceutical engineering related knowledge and mathematical modelling methods for comparison and comprehensive analysis of complex problems in the pharmaceutical process.

2. Problem Analysis: having the ability to comprehensively apply mathematics, natural science, pharmaceutical engineering professional knowledge, combined with literature, to identify, express and analyze complex pharmaceutical engineering problems, as well as verify the rationality of solutions and obtain effective conclusions.

2.1 Having the ability to use basic knowledge and methods of mathematics and natural sciences to identify and judge the key points of complex pharmaceutical engineering problems.

2.2 Having the ability to correctly express complex pharmaceutical engineering problems based on the basic knowledge and basic principles, as well as mathematical models of natural sciences and pharmaceutical engineering.

2.3 Having the ability to provide a variety of solutions based on the basic knowledge and basic principles, as well as literature of natural sciences and pharmaceutical engineering.

2.4 Having the ability to use the basic knowledge and basic principles of pharmaceutical engineering, with the help of literature research, to analyze the influencing factors in the pharmaceutical production process and obtain effective conclusions.

3. Design/development solutions:for complex pharmaceutical engineering problems, students can comprehensively use pharmaceutical engineering professional knowledge to design systems or process processes that meet specific needs and develop corresponding solutions. The design process should also reflect innovation awareness and consider society, health, safety, law, and culture as well as environmental factor.

3.1 Grasp the basic methods for designing the pharmaceutical production processes, and understand the factors that affect the goals of pharmaceutical engineering design and technical solutions.

3.2 Having the ability to complete the design of related units of API production and preparations in response to the specific requirements of solving complex problems in pharmaceutical engineering.

3.3 Having the ability to design and develop pharmaceutical units and process flows in accordance with the needs of drug design and production, and present the results in the forms of drawings, design instructions, etc., to reflect innovation consciousness.

3.4 Having the ability to consider social, health, safety, legal, cultural and environmental factors in pharmaceutical units, process flows, drug design and drug development.

4. Research: having the ability to conduct research on complex pharmaceutical engineering problems based on scientific principles and scientific methods, including experiment designing, experimental implementation, product testing, data analysis and obtaining reasonable and effective conclusions through related information.

4.1 Having the ability to use correct experimental methods to synthesize, analyze and identify drugs, and understand the determination methods of physical and chemical properties of drugs.

4.2 Having the ability to design and judge the research route and experimental scheme based on the pharmaceutical engineering professional theory and the specific drug preparation process.

4.3 Having the ability to choose or build experimental devices, adopt scientific and reasonable experimental methods, and conduct experiments safely.

4.4 Having the ability to collect and collate experimental data correctly, correlate, analyze and interpret experimental data, and obtain reasonable and effective conclusions through related information.

5. Using modern tools: having the ability to select and use appropriate computer technology, modern engineering tools and information technology tools for complex pharmaceutical engineering problems, including the prediction and simulation for complex engineering problems, and understand their limitations.

5.1 Knowing the usage principles of commonly used modern instruments and drawing tools, and master the use of information retrieval tools and professional databases.

5.2 Having the ability to select and use appropriate pharmaceutical engineering related software for pharmaceutical process design, process optimization, and equipment selection.

5.3 Having the ability to predict and simulate pharmaceutical engineering professional problems and understand the limitations of specific pharmaceutical processes and drug design with the help of pharmaceutical engineering related software.

6. Engineering and society: Understanding the laws and regulations related to drug production, design and R &D. Having the ability to conduct a rational analysis based on engineering-related background knowledge, evaluate the impact of professional engineering practices and complex engineering problem solutions on society, health, safety, law and culture, and understand the responsibilities.

6.1 Being familiar with technical standards, intellectual property rights, industrial policies, laws and regulations related to the pharmaceutical industry, and understanding the management system of pharmaceutical companies.

6.2 Being able to identify and analyze the interaction between the application of new drug products, new technologies and new processes on society, health, safety, law and culture, and understand the corresponding responsibilities.

7. Environment and sustainable development: having the ability to assess the impact of engineering practices for complex engineering issues on environmental and social sustainability.

7.1 Understanding and evaluating the impact of pharmaceutical engineering technology on economic, environmental and social sustainability.

7.2 Considering comprehensively the impact of pharmaceutical engineering practices on economic, environmental and social sustainability, proposing possible solutions and safety precautions in pharmaceutical design and production process from the perspective of environmental protection and social sustainable development.

8. Professional norms: Possessing humanities and social science literacy, social responsibility, establish and practice the socialist core values, be able to love work, be honest and friendly in pharmaceutical engineering practice, understand and abide by engineering professional ethics and norms, and fulfill responsibilities.

8.1 establishing and practicing the socialist core values, understand the socialist value system, and understand the history, national conditions, situation and policies.

8.2 Understanding the core concepts of engineering ethics; understanding the professional nature and responsibilities of professional engineers, and consciously abiding by professional ethics and norms in engineering practice with legal awareness.

8.3 Having humanistic knowledge, speculative ability, operation ability and scientific spirit and responsibilities of pharmaceutical engineers for public safety, health and welfare, environmental protection and sustainable development.

9. Individual and team: Having the ability to assume the roles of individuals, team members and other roles in a multidisciplinary team.

9.1 Having the ability to share information and cooperate with members of relevant discipline teams in the pharmaceutical engineering profession, and understand the role and significance of each discipline member for the entire team.

9.2 Having experience in organizational management; being able to integrate the opinions of team members and make sound decisions.

10. Communication: Communicating effectively with peers and the public on complex engineering issues, including writing reports and design contributions, presenting statements, articulating or responding to instructions; having a certain international perspective and the ability to communicate with others in a cross-cultural environment.

10.1 Being able to accurately express their own views on pharmaceutical professional issues in oral, written, graphic and other ways, respond to queries, and understand the differences in communication with peers in the industry and the public.

10.2 Being aware of the international development trends and research hotspots in the pharmaceutical field, understand and respect the differences and diversity of different cultures in the world.

10.3 Mastering foreign language application skills; being familiar with relevant professional foreign language knowledge; having a certain international perspective; being able to communicate with others in a cross-cultural environment.

11. Project management: Understanding and mastering engineering management principles and economic decision-making methods, and applying them in a multidisciplinary environment.

11.1 Having a sense of technical economy and project management, and understanding its role in the pharmaceutical process.

11.2 Applying the principles and methods of technology economy and project management to pharmaceutical product development, process design and process optimization, etc.

12. Life-long learning: Awareness of self-directed learning and lifelong learning, with the ability to continuously learn and adapt to development.

12.1 Being able to recognize the need for continuous exploration and learning, and having the awareness of independent learning and lifelong learning.

12.2 Understanding the professional status and development trends. Having the ability to autonomous and continuous learning and adaptive development.

IV.学制与学位 Duration and Degree

学制: 4 年

Duration: 4-Year

学位：工学学士

Degree: Bachelor of Engineering

V.主干学科与主干课程 Main Subject and Main Course

主干学科：化学、化学工程、中药学、药学。

Main Subject: Chemistry, Chemical engineering, Traditional Chinese Medicine, Pharmacy.

主干课程：1.学科基础与专业基础课：无机与分析化学、有机化学 B（I、II）、物理化学 A、生物化学 B、医药学基础等。2.专业课：仪器分析、药物化学 A、药物分析、化工原理 A、药剂学、中药炮制工程、中药制剂设计学、制药工艺学、制药分离工程、工程制图 A、制药设备与车间设计、药品生产质量管理工程等。

Main Course: 1. Discipline and Specialty Foundational Courses: Inorganic and Analytical Chemistry, Organic Chemistry B (I, II), Physical Chemistry A, Biochemistry B, Fundamentals of Medicine and Pharmacy, et al. 2. Specialized Courses: Instrumental Analysis, Medicinal Chemistry A, Pharmaceutical Analysis, Chemical Engineering Principles A, Pharmaceutics, Processing of Chinese Medicine Engineering, Chinese Medicine Pharmaceutical Design, Pharmaceutical Technology, Pharmaceutical Separation Engineering, Engineering Drawing A, Pharmaceutical Equipments & Workshop Design, Pharmaceutical Production Quality Management Engineering, et al.

VI.毕业学分基本要求 Basic Requirements of Credits for Graduation

课程体系 Curriculum System		学分要求 Credits Requirements						小计 Subtotal
		必修 Compulsory		限修 Distributional Electives		选修 Free Electives		
		理论 Theory	实践 Practice	理论 Theory	实践 Practice	理论 Theory	实践 Practice	
公共基础课程 Public Basic Courses	思想政治类 Ideological Politics Courses	15	2					17
	军事类 Military Courses	2	2					4
	外语类 Foreign Language Courses	6		2				8
	体育类 Physical Education Courses		4					4
通识教育课程 General Education Courses	核心通识课 Core General Education Courses			4				4
	新生研讨课 Freshman Seminar	2						2
学科与专业基础课程（含实验） Discipline and Specialty Foundational	数学与自然科学基础课 Foundational Courses on Mathematics and Natural Science	24	1					25

Courses (Including Experiment)	专业基础课 Professional Foundational Courses	19	3	2				24
专业课程（含 实验） Specialized Courses (Including Experiment)	专业核心课程 Specialized Core Course	33.5	7.5					41
	专业限修课程 Specialized Restricted Courses			5				5
实习实践教学 Practice Courses	基本技能训练、实习 实训、综合课程设计、 社会与文化素质实 践、毕业实习与毕业 设计 Basic Skills Training, Practical Training, Integrated Curriculum Design, Social and Cultural Quality Practice, Graduation Internship and Graduation Design		21					21
多元化课程 Diversified Courses	跨学科课程、美育专 业类课程、学科竞赛 类课程、其它个性化 选修课程等 Interdisciplinary Courses, Aesthetic Education Courses, Subject Competition Courses, other Personalized Elective Courses, etc					4		4
创新创业实践 Innovation and Entrepreneurs hip Practice	创新创业训练计划项 目、个性化实验、学 科竞赛、创新讲座等 Innovation and Entrepreneurship Training Program, Personalized Experiments, Subject Competition, Innovation Lectures, etc		2					2
必修环节 A Compulsory Part	大学生综合素质提 升、学生体质达标测 评 Comprehensive Quality Improvement Courses for College Students, Assessment of Students' Physical Fitness							0
总计 Total								161

VII.课程设置细化表 Course Programs Table

公共基础课程 Public Basic Courses 共 33 学分，其中必修 31 学分，限修 2 学分，选修 0 学分 A total credits of 33, including 31 for compulsory courses, 2 for distributional electives and 0 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class Practice Credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
思想政治类 Ideological Politics Courses	思想道德与法治 Ideological and Moral Education and the Rule of Law	必修 Compulsory	3	0.4	第 1 学期 1St Semester	马克思主义学院 School of Marxism	6.2 8.1 8.2	
	中国近现代史纲要 Conspectus of Chinese Modern History	必修 Compulsory	3	0.4	第 2 学期 2Nd Semester	马克思主义学院 School of Marxism	8.1	
	马克思主义基本原理 The Basic Principles of Marxism	必修 Compulsory	3	0.4	第 3 学期 3Rd Semester	马克思主义学院 School of Marxism	8.1	
	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics	必修 Compulsory	3	0.4	第 5 学期 5Th Semester	马克思主义学院 School of Marxism	8.1 12.1	
	习近平新时代中国特色社会主义思想概论 Outline of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	必修 Compulsory	3	0.4	第 6 学期 6Th Semester	马克思主义学院 School of Marxism	8.1 12.1	
	形势与政策 I Situation and Policy I	必修 Compulsory	0	0	第 1 学期 1St Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策II Situation and Policy II	必修 Compulsory	0	0	第 2 学期 2Nd Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策III Situation and Policy III	必修 Compulsory	0	0	第 3 学期 3Rd Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策IV Situation and Policy IV	必修 Compulsory	0	0	第 4 学期 4Th Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策 V Situation and Policy V	必修 Compulsory	0	0	第 5 学期 5Th Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策VI Situation and Policy VI	必修 Compulsory	0	0	第 6 学期 6Th Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策VII Situation and Policy VII	必修 Compulsory	0	0	第 7 学期 7Th Semester	马克思主义学院 School of Marxism	8.3 12.1	
	形势与政策VIII Situation and Policy VIII	必修 Compulsory	2	0	第 8 学期 8Th Semester	马克思主义学院 School of Marxism	8.3 12.1	

军事类 Military Courses	军事理论 Military Theories	必修 Compulsory	2	0	第 1 学期 1St Semester	武装部 Security Office	8.1	
	军事技能 Military Skills	必修 Compulsory	2	2	短 1 学期 Short Semester 1	武装部 Security Office	8.1	
外语类 Foreign Language Courses	英语 I College English I	必修 Compulsory	2	0	第 1 学期 1St Semester	外国语学院 School of Foreign languages	10.2 10.3	
	英语 II College English II	必修 Compulsory	2	0	第 2 学期 2Nd Semester	外国语学院 School of Foreign languages	10.2 10.3	
	通用学术英语 English for General Academic Purposes	必修 Compulsory	2	0	第 3 学期 3Rd Semester	外国语学院 School of Foreign languages	10.2 10.3	
	职场英语 Workplace English	限修 Distributional Elective	2	0	第 4 学期 4Th Semester	外国语学院 School of Foreign languages	10.2 10.3	限选 1 门, 2 学分 Limited to 1 course, 2 credits
	交际与文化视听说 Viewing, Listening & Speaking in English --Communication & Culture							
	语言、文化与翻译 Language, Culture and Translation							
	英语公共演讲 Public Speaking in English							
体育类 Physical Education Courses	体育 I Physical Education I	必修 Compulsory	1	1	第 1 学期 1St Semester	体育部 Dept. of Physical Education	9.1 9.2	
	体育 II Physical Education II	必修 Compulsory	1	1	第 2 学期 2Nd Semester	体育部 Dept. of Physical Education	9.1 9.2	
	体育 III Physical Education III	必修 Compulsory	0.5	0.5	第 3 学期 3Rd Semester	体育部 Dept. of Physical Education	9.1 9.2	
	体育 IV Physical Education IV	必修 Compulsory	0.5	0.5	第 4 学期 4Th Semester	体育部 Dept. of Physical Education	9.1 9.2	
	体育健康课程 I Diversified Physical Education Courses I	必修 Compulsory	0.5	0.5	第 5 学期 5Th Semester	体育部 Dept. of Physical Education	9.1 9.2	
	体育健康课程 II Diversified Physical Education Courses II	必修 Compulsory	0.5	0.5	第 6 学期 6Th Semester	体育部 Dept. of Physical Education	9.1 9.2	
通识教育课程 General Education Courses 共 6 学分, 其中必修 2 学分, 限修 4 学分, 选修 0 学分 A total credits of 6, including 2 for compulsory courses, 4 for distributional electives and 0 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes

核心通识课 Core General Education	“交通天下”通识课程体系 General Studies on Transportation	限修 Distributional Elective	4	0	2-8 学期 2-8 Semester	全校 The whole school	8.1 12.2	每个模块最多选修一门课程，原则上不选本学院所开设的课程。 One course from each module at most. No course offered by School of Life Science and Engineering
新生研讨课 Freshman Seminar	医药与人类社会 Medicine and Human Society	必修 Compulsory	2	0	第 1 学期 1St Semester	生命科学与工程学院 School of Life Science and Engineering	8.1 9.2 12.1	
学科与专业基础课程（含实验） Discipline and Specialty foundational Courses (Including Experiment) 共 49 学分，其中必修 47 学分，限修 2 学分，选修 0 学分 A total credits of 47, including 44 for compulsory courses, 3 for distributional electives and 0 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求指标点 Indicators which Support Graduation Requirements	备注 Notes
数学与自然科学基础课 Foundational Courses on Mathematics and Natural Science	微积分 Calculus	必修 Compulsory	5	0	第 1 学期 1St Semester	数学学院 School of Mathematics	1.1 1.2	
	线性代数 B Linear Algebra B	必修 Compulsory	3	0	第 1 学期 1St Semester	数学学院 School of Mathematics	1.3 2.2	
	概率论与数理统计 Probability & Mathematical Statistics	必修 Compulsory	3	0	第 2 学期 2Nd Semester	数学学院 School of Mathematics	1.2	
	大学物理 B I College Physics B I	必修 Compulsory	3	0	第 2 学期 2Nd Semester	物理科学与技术学院 School of Physics	1.1	
	大学物理 B II College Physics B II	必修 Compulsory	3	0	第 3 学期 3Rd Semester	物理科学与技术学院 School of Physics	1.1	
	计算机程序设计基础 Fundamentals of Computer Programming	必修 Compulsory	3	1	第 2 学期 2Nd Semester	计算机与人工智能学院 School of Computing and Artificial Intelligence	5.2 12.2	
	电工与电子技术基础 Electrotechnics and Electronic Techniques	必修 Compulsory	2	0	第 3 学期 3Rd Semester	电气工程学院 School of Electrical Engineering	1.3	
	计算机辅助设计 Computer Aided Design	必修 Compulsory	2	0	第 4 学期 4Th Semester	生命科学与工程学院 School of Life Science and Engineering	5.1 5.2	

专业基础课 Professional Foundational Courses	无机与分析化学 Inorganic and Analytical Chemistry	必修 Compulsory	4	0	第 1 学期 1St Semester	生命科学与 工程学院 School of Life Science and Engineering	1.1 2.1	
	无机与分析化学实验 Experiments of Inorganic & Analytic Chemistry	必修 Compulsory	1	1	第 1 学期 1St Semester	生命科学与 工程学院 School of Life Science and Engineering	4.1 5.1	
	医药学基础 Fundamentals of Medicine and Pharmacy	必修 Compulsory	3	0	第 2 学期 2Nd Semester	生命科学与 工程学院 School of Life Science and Engineering	8.1 12.2	
	有机化学 BI Organic Chemistry BI	必修 Compulsory	2	0	第 2 学期 2Nd Semester	生命科学与 工程学院 School of Life Science and Engineering	1.2 1.3 2.2	
	有机化学 BII Organic Chemistry BII	必修 Compulsory	2	0	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	1.2 1.3 2.2	
	有机化学实验 Organic Chemistry Experiment	必修 Compulsory	1	1	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	4.2 4.3	
	物理化学 A Physical Chemistry A	必修 Compulsory	3	0	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	1.3 2.1 2.4	
	物理化学实验 Experiments of Physical Chemistry	必修 Compulsory	1	1	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	4.1 4.2	
	生物化学 B Biochemistry B	必修 Compulsory	3	0	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	2.1 4.1	
	英语科技论文写作 Scientific Writing	必修 Compulsory	1	0	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	5.3 10.1	
	工程经济与项目管理 Engineering Economic and Project Management	必修 Compulsory	2	0	第 6 学期 6Th Semester	经济管理学院 School of Economics and Management	9.2 11.1 11.2	
专业基础 限修课 Professional Foundational Courses	大学物理实验 I College Physics Experiment I	限修 Distributional Elective	1	1	第 2 学期 2Nd Semester	物理科学与 技术学院 School of Physics	4.1 4.4	限修 2 学分 Distributional Elective 3 credits

专业基础 限修课 Professional Foundational Courses	大学物理实验 II College Physics Experiment II	限修 Distributional Elective	1	1	第 3 学期 3Rd Semester	物理科学与 技术学院 School of Physics	4.1 4.4	限修 2 学分 Distributional Elective 3 credits
	生物化学实验 B Biochemistry Experiment B	限修 Distributional Elective	1	1	第 3 学期 3Rd Semester	生命科学与 工程学院 School of Life Science and Engineering	4.1 4.3	
	天然药物化学 Natural Medicine Chemistry	限修 Distributional Elective	2	0	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	1.3 2.1	
	微生物学 B Microbiology B	限修 Distributional Elective	2	0.5	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	2.3 4.3	
专业课程（含实验） Specialized Courses(Including Experiment) 共 46 学分，其中必修 41 学分，限修 5 学分，选修 0 学分 A total credits of 48, including 43 for compulsory courses, 5 for distributional electives and 0 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实 践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
专业核心课 程 Specialized Core Course	仪器分析 Instrumental Analysis	必修 Compulsory	2	0	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	4.3 5.2	
	仪器分析实验 Instrumental Analysis Experiment	必修 Compulsory	1	1	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	4.4 5.1	
	药物化学 A Medicinal Chemistry A	必修 Compulsory	3	0	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	1.1 2.2 2.4	
	药物化学实验 A Medicinal Chemistry Experiment A	必修 Compulsory	1	1	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	4.2 4.3 5.1	
	化工原理 A Principles of Chemical Engineering A	必修 Compulsory	4	0	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	1.2 2.1 2.2 3.1	
	化工原理实验 B Principles of Chemical Engineering Experiment B	必修 Compulsory	1.5	1.5	第 4 学期 4Th Semester	生命科学与 工程学院 School of Life Science and Engineering	2.3 4.2 9.1	

专业核心课程 Specialized Core Course	工程制图 A Engineering Drawing A	必修 Compulsory	3	0	第 4 学期 4Th Semester	生命科学与工程学院 School of Life Science and Engineering	5.1 10.1	
	药物分析 Pharmaceutical Analytics	必修 Compulsory	2	0	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	4.1 4.2 6.1	
	药物分析实验 Pharmaceutical Analysis Experiment	必修 Compulsory	1	1	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	4.1 5.3	
	药剂学 Pharmaceutics	必修 Compulsory	3	0	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	3.2 5.2 5.3	
	药剂学实验 Pharmaceutics Experiment	必修 Compulsory	1	1	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	4.2 4.4	
	药物合成反应 Drug Synthesis	必修 Compulsory	2.5	0.5	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	1.1 2.4 4.1	
	中药炮制工程 Processing of Chinese Medicine Engineering	必修 Compulsory	2	0	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	2.4 3.1	
	化工仪表及自动化 Chemical Meter and Automation	必修 Compulsory	2	0	第 5 学期 5Th Semester	电气工程学院 School of Electrical Engineering	1.2 1.3 2.3	
	药品生产质量管理工程 Pharmaceutical Production Quality Management Engineering	必修 Compulsory	2	0	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	6.1 11.1	
	中药制剂设计学 Pharmaceutical Design of Traditional Chinese Medicine	必修 Compulsory	2	0.5	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	2.1 3.3 7.1	
	制药工艺学 Pharmaceutical Technology	必修 Compulsory	2	0	第 6 学期 6Th Semester	生命科学与工程学院 School of Life Science and Engineering	1.1 1.4 3.1 7.1 11.1	
	制药设备与车间设计 Pharmaceutical Equipments& Workshop Design	必修 Compulsory	3	0.5	第 6 学期 6Th Semester	生命科学与工程学院 School of Life Science and Engineering	1.4 3.3 3.4 5.2	

	制药分离工程 Pharmaceutical Separation Engineering	必修 Compulsory	2	0.5	第 7 学期 7Th Semester	生命科学与工程学院 School of Life Science and Engineering	1.4 3.4	
	制药过程安全与环保 Safety and environmental protection of pharmaceutical process	必修 Compulsory	1	0	第 7 学期 7Th Semester	生命科学与工程学院 School of Life Science and Engineering	7.1 7.2 8.3	
专业限修课程 Specialized Restricted Courses	药理学 Pharmacology	限修 Distributional Elective	3	0.5	第 3 学期 3Rd Semester	生命科学与工程学院 School of Life Science and Engineering	3.1 4.4	限修 5 学分 Distributional Elective 5 credits
	中药生物技术与工程 Biotechnology and Engineering of Traditional Chinese Medicine	限修 Distributional Elective	2	0	第 4 学期 4Th Semester	生命科学与工程学院 School of Life Science and Engineering	2.3 7.2	
	药用高分子材料 Polymer Material in Pharmaceutics	限修 Distributional Elective	2	0	第 5 学期 5Th Semester	生命科学与工程学院 School of Life Science and Engineering	2.1 3.4	
实习实践教学 Practice Course 共 21 学分，其中必修 21 学分，限修 0 学分，选修 0 学分 A total credits of 21, including 21 for compulsory courses, 0 for distributional electives and 0 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
基本技能训练、实习实训、综合课程设计、社会与文化素质实践、毕业实习与毕业设计 Basic Skills Training, Practical Training, Integrated Curriculum Design, Social and Cultural Quality Practice, Graduation Internship and Graduation Design	工程训练 C Engineering Training C	必修 Compulsory	1	1	第 3 学期 3Rd Semester	工程训练中心 Engineering Training Center	5.1 9.2	
	专业认识实习 Specialty Understanding Practice	必修 Compulsory	1	1	短 1 学期 Short Semester 1	生命科学与工程学院 School of Life Science and Engineering	6.1 7.1 9.2	
	化工原理课程设计 Design of Principles of Chemical Engineering	必修 Compulsory	2	2	短 2 学期 Short Semester 2	生命科学与工程学院 School of Life Science and Engineering	1.4 3.1 3.2 11.2	
	制药工程课程设计 Design of Pharmaceutical Engineering	必修 Compulsory	3	3	短 3 学期 Short Semester 3	生命科学与工程学院 School of Life Science and Engineering	3.2 6.2 9.2 11.2	

	制药工艺学综合实验 Comprehensive Experiments of Pharmaceutical Technology	必修 Compulsory	2	2	短 3 学期 Short Semester 3	生命科学与工程学院 School of Life Science and Engineering	2.3 11.1 12.2	
	生产实习 Production Practice	必修 Compulsory	2	2	短 3 学期 Shor Semester 3	生命科学与工程学院 School of Life Science and Engineering	6.1 6.2 8.2 10.1	
	毕业设计（论文） Graduation Project	必修 Compulsory	10	10	第 8 学期 8Th Semester	生命科学与工程学院 School of Life Science and Engineering	3.3 4.4 7.2 10.1 10.2	
多元化课程 Diversified course 共 4 学分，其中必修 0 学分，限修 0 学分，选修 4 学分 A total credits of 4, including 0 for compulsory courses, 0 for distributional electives and 4 for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
跨学科课程 Interdisciplinary Course	全校跨学科课程 Interdisciplinary Course of University	选修 Free Electives	4	-	6-7 学期 6-7 Semester	全校 The whole school	12.1 12.2	选修 4 学分，按照《西南交通大学多元化课程修读指导手册》执行。 Free Electives 4 Credits ,Follow the 《Instruction manual of diversified courses of southwest Jiaotong University》
美育专业类课程 Aesthetic Education Specialty Courses	全校美育专业类课程 Aesthetic Education Specialty Courses of University			-				
学科竞赛类课程 Subject Competition Courses	全校学科竞赛课程 Subject Competition Courses of University			-				
个性化选修课程 Personalized Elective Courses	全校个性化选修课程 Personalized Elective Courses of University			-				
创新创业实践 Innovation and Entrepreneurship Practice 共 2 学分，其中必修 2 学分，限修 0 学分，选修 0 学分 A total credits of 2, including 2 for compulsory courses, 0 for distributional electives and 0 for free electives								

课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
创新创业训练计划项目、个性化实验、学科竞赛、创新讲座等 Innovation and Entrepreneurship Training Program, Personalized Experiments, Subject Competition, Innovation Lectures, etc	课外创新实践* Extracurricular Innovative Practice	必修 Compulsory	2	2	1-7 学期 1-7 Semester	生命科学与工程学院 School of Life Science and Engineering	9.1 9.2 12.1	按照《西南交通大学创新实践学分认定与管理办法》规定执行 By Credit Recognition and Management of Innovative Practice in Southwest Jiaotong University
必修环节 A compulsory part 共 0 学分，其中必修 0 学分，限修 0 学分，选修 0 学分 A total credits of 0 , including 0 for compulsory courses, 0 for distributional electives and X for free electives								
课程类型 Course Type	课程名称 Course Name	课程性质 Nature of Course	总学分 Credits	课内实践学分 In-class practice credits	开课学期 Semester	开课学院 School	支撑毕业要求 指标点 Indicators which Support Graduation Requirements	备注 Notes
大学生综合素质提升、学生体质达标测评 Comprehensive Quality Improvement Courses for College Students, Assessment of Students' Physical Fitness	大学生综合素质提升（第二、第三课堂） Comprehensive Quality Improvement Courses for College Students (The Second and Third Classroom)	必修 Compulsory	0	0	1-8 学期 1-8 Semester	校团委 Communist Youth League Committee	8.1 8.2	
	学生体质达标测评 Assessment of Students' Physical Fitness	必修 Compulsory	0	0	秋季学期 fall Semester	体育部 Dept. of Physical Education	9.1 9.2	
学分总计 Total Credits			161					