沈阳化工大学本科培养方案

信息工程学院

专业名称：测控技术与仪器

专业代码：080301

制　　定：封岸松

审　　核：孔晓光

审　　定：于三三

批　　准：金志浩

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测控技术与仪器专业培养方案

一、培养目标

本专业培养综合素质良好，德、智、体、美、劳全面发展，能在流程工业等领域从事仪器仪表及智能测控系统的分析、设计、开发、运行及管理等工作的德智体美劳全面发展的应用型工程技术人才和社会主义接班人。

本专业毕业生在毕业后 5 年左右：

（1）具有熟练运用工程数理知识和测控专业知识解决流程工业等领域的仪器仪表、智能测控等工程问题的能力。

（2）具有运用现代工具和先进技术对流程工业等领域的仪器仪表、智能测控系统进行创新性分析、设计、集成和服务的能力。

（3）具有正确的世界观和人生观，具备有效的沟通、表达能力及项目管理能力，有良好的团队协作精神，能在工程实践中综合考虑法律、环境、社会、经济等方面因素。

（4）具有广阔的国际视野，主动适应不断变化的国内外形势和环境，具备终生学习的能力，能够胜任不断发展的测控技术领域工作。

二、专业方向

智能测控方向

三、毕业要求

根据本专业人才培养目标以及我校测控技术与仪器专业多年的人才培养经验，从适应社会发展的需求出发，明确现阶段本专业的毕业能力要求及其指标点分解如下：

毕业能力要求	指标点
毕业要求 1： 能够应用数学、自然科学等领域的理论与方法及工程基础和测控专业知识、技能与工具，以设计项目为载体，解决流程工业等领域仪器仪表、测控等相关复杂工程问题。	1-1.综合运用数学、自然科学、工程基础和专业知识，发现与表述一般工程问题。
	1-2.经过合理的简化、推理和分析，综合应用测控专业多方面的知识，建立仪器仪表装置在全生命周期的数学模型并求解。
	1-3.掌握仪器仪表、流程工业等领域专业知识，并能够用于推演、分析仪器仪表、流程工业等领域的复杂工程问题。
	1-4.能够综合运用数学、自然科学、工程基础和专业知识，解决仪器仪表、流程工业等领域的复杂工程问题。
毕业要求 2： 能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究来分析流程工业等领域的复杂测控工程问题，以获得有效结论。	2-1.能够运用数学、自然科学和工程科学的基本原理，识别仪器仪表、流程工业等相关领域复杂工程问题中的关键环节。
	2-2.能够通过测控技术基础原理和数学模型等方法正确表达仪器仪表、流程工业等相关领域的复杂工程问题。
	2-3.能够运用工程基础和专业知识，通过文献研究来分析仪器仪表、流程工业等相关领域的复杂工程问题，并获得有效结论。
毕业要求 3： 能够针对仪器仪表、智能检测与控制等	3-1.了解影响仪器仪表、流程工业等领域工程问题设计目标和技术方案的各种因素，能够提出仪器仪表、流程工业等相关领域复杂工程问题的解决方案。

复杂工程问题设计解决方案，设计满足特定需求的系统、单元（部件），并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。	3-2.能够根据用户的特定需求，设计合理的智能测控系统、单元。
	3-3.能够在设计中综合考虑社会、健康、安全、环境、法律等现实约束条件，并体现创新意识。
毕业要求 4： 能够基于科学原理并采用科学方法对仪器仪表、智能检测与控制的复杂工程问题进行研究，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.能够基于专业理论，根据对象特性，选择研究路线。
	4-2.能够基于科学原理并采用科学方法对仪器仪表、流程工业等相关领域的复杂工程问题设计实验方案，采用科学的实验方法，合理规范地进行实验并获取数据。
	4-3.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。
毕业要求 5： 能够针对流程工业等相关领域的仪器仪表、智能测控系统的复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术，对复杂工程问题进行预测与模拟，并能够理解其局限性。	5-1.具备计算机、网络及现代工程工具的知识，掌握现代仪器仪表、建模和软件开发工具、EDA 仿真及设计等软硬件工具的使用原理和方法。
	5-2.能够选择与使用恰当的仪器设备、信息资源、建模和软件开发工具、EDA 软硬件开发工具，对复杂工程问题分析，进行设计与开发，包括对复杂工程问题的预测与模拟，并能够分析其局限性。
毕业要求 6： 能够基于流程工业等领域相关的背景知识，对智能检测与控制工程实践和复杂工程问题解决方案进行合理分析，评价其对社会、健康、安全、法律以及文化的影响，并理解测控专业工程师应承担的责任。	6-1.能够在实习、专业实践以及社会实践等学习中，理解与使用与仪器仪表及相关行业相关的技术标准、产业规范，尊重相关领域的知识产权和法律法规。
	6-2.能够评价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，理解在相关工程实践中应承担的责任。
毕业要求 7： 能够理解和评价针对流程工业等领域的智能测控复杂工程问题的工程实践对环境、社会可持续发展的影响。	7-1.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持续发展的角度考虑仪器仪表、流程工业等相关领域工程实践的可持续性，评价仪器仪表、流程工业等相关领域工程全周期中可能对人类和环境造成的影响，并减少隐患和影响。
毕业要求 8： 具有人文社会科学素养、社会责任感，能够在流程工业等领域的仪器仪表、智能测控等工程实践中理解并遵守工程职业道德和规范，履行责任。	8-1.具有正确的世界观、人生观、价值观，具有良好的人文社会科学素养、社会责任感，树立和践行社会主义核心价值观，明确个人作为社会主义事业建设者和接班人所肩负的责任和使命，了解中国国情。
	8-2.理解诚实公正、诚信守则的工程师职业道德和规范，并能在仪器仪表、流程工业等相关工程领域工程实践中遵守并承担责任。
毕业要求 9： 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.在仪器仪表与流程工业领域工程实践团队中，能够和多学科成员沟通共事，能够独立或合作完成相应的任务。
	9-2.在仪器仪表与流程工业领域工程实践中，理解团队成员与负责人的角色，具备团队领导能力。
毕业要求 10： 能够就仪器仪表、智能测控等复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、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.能够就仪器仪表、流程工业等相关工程领域专业问题与业界同行和社会公众进行有效的口头和书面表达、人际交流、电子及多媒体交流。
	10-2.具备外语交流能力，具有一定的国际化视野，能够在跨文化背景下进行沟通和交流。

毕业要求 11： 理解并掌握智能测控工程等方面的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.理解并掌握仪器仪表、流程工业等相关工程中涉及的管理与经济决策方法。
	11-2.能够应用工程管理原理与经济决策方法对仪器仪表、流程工业领域的复杂工程问题进行有效分析和综合评价，提出经济、合理的解决方案。
毕业要求 12： 具有自主学习和终身学习的意识，具有不断学习和适应发展的能力。	12-1.能够对自我探索和终身学习的必要性有正确认识，具有自主学习的意识。
	12-2.充分认识到智能仪器、流程工业等相关工程领域的快速发展以及自主学习、终身学习的重要性，具有健康良好的心理、身体素质，以适应工作中的各种任务。

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

毕业要求支撑培养目标实现的关系矩阵

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

四、主干学科

仪器科学与技术

五、专业核心课程

电路分析基础、模拟电子技术、数字电子技术、计算机控制技术、自动控制原理、误差理论与数据处理、传感器原理及应用、智能仪表原理及设计、化工过程检测技术及仪表、嵌入式系统。

六、修业年限

本科基本学制 4 年，弹性学习年限 3-6 年，按照学分制度管理。

七、授予学位

学生应至少修满 167.5 学分方可毕业。符合《沈阳化工大学本科毕业生学士学位授予工作有关规定(2017 年 3 月修订)》学位授予条件者，可授予工学学士学位。

八、学分要求

课程类别	课程模块		课程性质	学分要求	小计	比例（%）
通识教育课	通识教育必修课	思政类	必修	17	43.5	26
		外语类		12		
		计算机类		4.5		
		军事安全类		2		
		劳动体育类		5		
		创新创业类		2		
		心理健康类		1		
	通识教育选修课	美育类 (400)	选修	2	8	4.8
		中国与世界(500)		2		
		四史(600)		1		
		经济管理类(700) 技术经济与工程项目管理		1		
		传统文化(900)		2		
	通识教育实践课	军训	实践	2	2	1.2
学科平台课	学科基础课程	公共基础类	必修	63.5	63.5	68
		专业基础类				
	学科实践课程	-	实践			
专业教育课	专业核心课程	-	必修	16.5	42.5	
	专业选修课程	-	选修	4		
	专业实践课程	-	实践	22		
能力拓展课	专业特色课程	-	必修（或实践）	8	8	
课外环节	课外通识实践	人文社会实践	课外实践	4		
		身心健康实践				
		外语技能实践				
	创新创业实践	创新训练		4		
		创新大赛				
		创客活动				
	生涯教育	成长规划类		1		
总学分/比例					167.5	100

Measurement and control technology and instrument 2021 Undergraduate Education Program

I. Educational Objectives

Educational Objectives

This major aim to cultivate the application-oriented engineering and technical talents and socialist successors with good comprehensive quality, all-round development of morality, intelligence, sports, beauty and labor who can be engaged in the analysis, design, development, operation and management of instruments and intelligent measurement and control systems in the field of process industry.

About 5 years after graduation from this major:

（1）Have the ability to skillfully use engineering mathematical knowledge and measurement and control professional knowledge to solve engineering problems such as instrumentation, intelligent measurement and control in process industry and other fields.

（2）It has the ability to use modern tools and advanced technology for innovative analysis, design, integration and service of instruments and intelligent measurement and control systems in process industry and other fields.

（3）Have a correct world outlook and outlook on life, have the ability of effective communication, expression and project management, have a good team spirit, and be able to comprehensively consider legal, environmental, social, economic and other factors in engineering practice.

（4）With broad international vision, actively adapt to the changing situation and environment at home and abroad, have the ability of lifelong learning, and be competent for the continuous development of measurement and control technology.

II. Major direction

Intelligent measurement and control direction

III. Graduation Requirements

According to the talent training objectives of this major and the many years of talent training experience of Measurement and control technology and instrument in our university, starting from the needs of social development, it is clear that the graduation requirements of this major at this stage are as follows:

Graduation Requirements	Indices
Requirement 1： Be able to apply the theories and methods of mathematics, natural science, and other fields, as well as the engineering foundation and professional knowledge, skills and	1-1. Using mathematics, natural science, engineering foundation and professional knowledge to discover and express general engineering problems.
	1-2. After reasonable simplification, reasoning and analysis, the mathematical model of instrumentation in the whole life cycle is established and solved by comprehensive application of the professional knowledge of measurement and control.

tools of measurement and control, and take the design project as the carrier to solve the complex engineering problems related to instrumentation, measurement and control in process industry and other fields.	1-3. Master the professional knowledge in instrumentation, process industry and other fields, and be able to deduce and analyze the complex engineering problems in instrumentation, process industry and other fields.
	1-4. Be able to use mathematics, natural science, engineering foundation and professional knowledge to solve complex engineering problems in instrumentation, process industry and other fields.
Requirement 2： It can apply the basic principles of mathematics, natural science, and engineering science to identify, express and analyze complex measurement and control engineering problems in process industry and other fields through literature research, to obtain effective conclusions.	2-1. Be able to use the basic principles of mathematics, natural science, and engineering science to identify the key links of complex engineering problems in instrumentation, process industry and other related fields.
	2-2. It can correctly express complex engineering problems in instrumentation, process industry and other related fields through the basic principles and mathematical models of measurement and control technology.
	2-3. Be able to use engineering foundation and professional knowledge to analyze complex engineering problems in instrumentation, process industry and other related fields through literature research, and obtain effective conclusions.
Requirement 3： Be able to design solutions for complex engineering problems such as instrumentation, intelligent detection and control, design systems, units (components) to meet specific needs, and reflect the sense of innovation in the design process, considering social, health, safety, legal, cultural, and environmental factors.	3-1. Understand the various factors that affect the design objectives and technical solutions of engineering problems in instrumentation, process industry and other fields, and be able to propose solutions to complex engineering problems in instrumentation, process industry and other related fields.
	3-2. According to the specific needs of users, we can design reasonable intelligent measurement and control system and unit.
	3-3. The design can comprehensively consider social, health, safety, environment, legal and other practical constraints, and reflect the sense of innovation.
Requirement 4： Based on scientific principles and scientific methods, we can study the complex engineering problems of instrumentation, intelligent detection, and control, including designing experiments, analyzing, and interpreting data, and getting reasonable and effective conclusions through information synthesis.	4-1. Be able to choose research route based on professional theory and object characteristics.
	4-2. Based on scientific principles and scientific methods, we can design experimental schemes for complex engineering problems in instrumentation, process industry and other related fields, and use scientific experimental methods to conduct experiments and obtain data in a reasonable and standardized way.
	4-3. It can analyze and explain the experimental results, and get reasonable and effective conclusions through information synthesis.
Requirement 5： Be able to develop, select and use appropriate technology, resources, modern engineering tools and information technology to predict and simulate complex engineering problems, and understand their limitations.	5-1. Have the knowledge of computer, network, and modern engineering tools, master the use principle and method of modern instruments, modeling and software development tools, EDA Simulation and design and other software and hardware tools.
	5-2. Be able to select and use appropriate instruments and equipment, information resources, modeling and software development tools, EDA software and hardware development tools to analyze, design and develop complex engineering problems, including prediction and Simulation of complex engineering problems, and be able to analyze their limitations.

Requirement 6： Based on the relevant background knowledge of process industry and other fields, reasonably analyze the intelligent detection and control engineering practice and complex engineering problem solutions, evaluate their impact on society, health, safety, law, and culture, and understand the responsibilities of measurement and control professional engineers.	6-1. Be able to understand and use the technical standards and industrial norms related to instruments and related industries in internship, professional practice, and social practice, and respect the intellectual property rights and laws and regulations in related fields.
	6-2. Be able to evaluate the impact of engineering practice and complex engineering problem solutions on society, health, safety, law, and culture, and understand the responsibilities in relevant engineering practice.
Requirement 7： Be able to understand and evaluate the impact of the engineering practice of intelligent measurement and control complex engineering problems in the field of process industry on the sustainable development of environment and society.	7-1. Know and understand the concept and connotation of environmental protection and sustainable development.
	7-2. Be able to consider the sustainability of engineering practice in instrumentation, process industry and other related fields from the perspective of environmental protection and sustainable development, evaluate the possible impact on human and environment in the whole cycle of Engineering in instrumentation, process industry and other related fields, and reduce hidden dangers and impacts.
Requirement 8： Have humanities and social science literacy, sense of social responsibility, be able to understand and abide by the engineering professional ethics and norms in the process industry and other fields of instrumentation, intelligent measurement, and control engineering practice, and fulfill the responsibility.	8-1. We should have a correct world outlook, values, and outlook on life, have a good quality of Humanities and Social Sciences and a sense of social responsibility, establish, and practice the socialist core values, clarify the responsibilities and missions of individuals as builders and successors of the socialist cause, and understand China's national conditions.
	8-2. Understand the engineer's professional ethics and norms of honesty, justice, and integrity, and be able to abide by and take responsibility in the engineering practice of instrumentation, process industry and other related engineering fields.
Requirement 9： Be able to play the role of individual, team member and leader in a multidisciplinary team.	9-1. In the field of instrumentation and process industry engineering practice team, be able to communicate and work with multidisciplinary members, and be able to complete corresponding tasks independently or cooperatively.
	9-2. Understand the roles of team members and leaders in the field of instrumentation and process industry, and have the ability of team leadership.
Requirement 10： Be able to effectively communicate with peers in the industry and the public on complex engineering issues such as instrumentation and intelligent measurement and control, including writing reports and design manuscripts, making statements, clearly expressing, or responding to instructions, and have a certain international vision, and be able to communicate and exchange in a	10-1. Be able to effectively communicate with peers in the industry and the public in terms of oral and written expression, interpersonal communication, electronic and multimedia communication on professional issues in instrumentation, process industry and other related engineering fields.
	10-2. Have the ability of foreign language communication, have a certain international vision, be able to communicate and exchange in the cross-cultural background.

cross-cultural context.	
Requirement 11: Understand and master the engineering management principles and economic decision-making methods of intelligent measurement and control engineering, and be able to apply them in multidisciplinary environment.	11-1. Understand and master the management and economic decision-making methods involved in instrumentation, process industry and other related projects.
	11-2. Able to apply engineering management principles and economic decision-making methods to effectively analyze and comprehensively evaluate complex engineering problems in instrumentation and process industry, and put forward economic and reasonable solutions.
Requirement 12: Have the consciousness of self-learning and lifelong learning, have the ability of continuous learning and adapting to development.	12-1. Be able to have a correct understanding of the necessity of self-exploration and lifelong learning, and have the consciousness of autonomous learning.
	12-2. Fully aware of the rapid development of intelligent instruments, process industry and other related engineering fields, as well as the importance of self-learning and lifelong learning, with good psychological and physical quality to adapt to various tasks in the work.

Professional graduation requirements should be able to support the achievement of training objectives.

Establish the relationship matrix of graduation requirements to support the realization of training objectives.

The relationship between graduation requirements and educational objectives

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

IV. Major Subject

Instruments Science and Technology.

V. Core Courses

Fundamentals of circuit analysis, Analog electronic technology, Digital electronic technology, Computer Control Technology, The Principle of Automatic Control, Error Theory and Data Processing, Sensor Principle and Application, The Design and Principal of Intelligent Instrument, Chemical Process Detection Techniques and Sensors, The Embedded System.

VI. Educational System

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

VII. Confer Degrees

Students should complete at least 167.5 credits before graduation. The Bachelor of engineering degree can be granted to those who meet the degree awarding requirements of the relevant regulations on the awarding of bachelor's degree for graduates of Shenyang University of Chemical Technology (revised in March 2017).

VIII. Credit Requirements

Course Type	Course Modules		Course Nature	Credit Requirement	Subtotal	Proportion （%）
General Education	Subject Platform Course General Education Compulsory Course	Ideological and Political Education	Compulsory	17	43.5	26
		Foreign Languages		12		
		Computer		4.5		
		Military Security		2		
		Labor Sports		5		
		Innovation and Entrepreneurship		2		
		Mental Health		1		
	General Education Elective Subjects	Aesthetic Education (400)	Elective	2	8	4.8
		China and the World (500)		2		
		Four Histories (600)		1		
		Economic Management (700)		1		
		Traditional Culture (900)		2		
	General Education Practice Course	Military Training	Practice	2	2	1.2
Discipline Education	Basic Subject Courses	Public Basic Class	Compulsory	63.5	63.5	68
		Professional Foundation				
	Subject Practice course	-	Practice			
Specialized Education	Professional Core Courses	-	Compulsory	16.5	42.5	
	Professional Elective Courses	-	Elective	4		
	Professional Practice Courses	-	Practice	22		
Competency Development	Professional Characteristic Courses	-	Compulsory (or Practice)	8	8	
Extracurricular Links	Extracurricular General Knowledge Practice	Humanistic Social Practice	Extracurricular Practice	4		
		Physical and Mental Health Practice				
		Foreign Language Skills Practice				
	Innovation and Entrepreneurship Practice	Innovation Training		4		
		Innovation Competition				
		Maker Activities				
	Career Education	Growth Planning		1		
Total Credits / Proportion					167.5	100

九、测控技术与仪器专业教学进程表

Table of Teaching Schedule for Measurement and control technology and instrument Major

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外 实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
通识教育课 General Education	必修 Compulsory	思政类 Ideological and Political Courses	0710093001	思想道德与法治 ‖ Ideological Morality and the Rule of Law	3.0	48	32			16		2							
			0710053001	中国近现代史纲要 ‖Outline of Chinese Contemporary and Modern History	3.0	48	32			16	2								
			0710103001	马克思主义基本原理* ‖Basic Principles of Marxism*	3.0	48	32			16				2					
			0710133001	毛泽东思想和中国特色社会主义理论体系概论* ‖Mao Zedong Thought and Theory of Socialism with Chinese Characteristics*	3.0	48	32			16				2					
			0710123001	习近平新时代中国特色社会主义思想概论‖ Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	3.0	48	40			8					3				
			0710012301	形势与政策 ‖Current Situation and Policies	2.0	64	64				2	2	2	2	2	2	2	2	
		外语类 Foreign Language Courses	0211003101	大学外语I ‖College English I	3.0	48	48				3								
			0211003201	大学外语II* ‖College English II*	3.0	48	48					3							
			0241003301	大学外语III ‖College English III	3.0	48	48						3						五选一
				大学外语III（进阶英语） ‖ College English III（Advanced English CET 6-Orientated）	3.0	48	48						3						

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
通识教育课 General Education	必修 Compulsory	外语类 Foreign Language Courses		大学外语III（英语口语表达与交流） ‖ College English III（English Oral Expression and Communication）	3.0	48	48						3						五选一
				大学外语III（跨文化交际） ‖ College English III（Intercultural Communication）	3.0	48	48						3						
				大学外语III（英语写作表达与交流） ‖ College English III（English Writing Expression and Communication）	3.0	48	48						3						
			0241003401	大学外语IV* ‖College English IV*	3.0	48	48							3					
				大学外语IV（进阶英语） ‖ College EnglishIV（Advanced English CET 6-Orientated）	3.0	48	48							3					
				大学外语IV（英语口语表达与交流） ‖ College EnglishIV（English Oral Expression and Communication）	3.0	48	48							3					
				大学外语IV（跨文化交际） ‖ College English IV（Intercultural Communication）	3.0	48	48							3					
				大学外语IV（英语写作表达与交流） ‖ College English IV（English Writing Expression and Communication）	3.0	48	48							3					
		计算机类 Computer Courses	1511372002	C 语言程序设计 ‖C Programming Language	2.5	44	32		12			2							
			1513992002	Python 语言程序设计 ‖Python Programming Language	2.0	36	24		12			2							
		军事安全类 Military and Safety Courses	0710081001	军事理论 ‖Military Theory	1.0	16	16					2							
			1510261302	安全教育 ‖Safety Education	1.0	16	16				1	1	1	1	1	1	1		

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
通识教育课 General Education	必修 Compulsory	劳动体育类 Labor and Sport Education	2640021001	劳动教育 ‖Labour Education	1.0	16	16					2							
			0410011101	大学体育I ‖College Physical EducationI	1.0	36		36			2								
			0410021201	大学体育II ‖College Physical EducationII	1.0	36		36				2							
			0410031301	大学体育III ‖College Physical EducationIII	1.0	36		36					2						
			0410041401	大学体育IV ‖College Physical EducationIV	1.0	36		36						2					
		创新创业类 Innovation and Entrepreneurship courses	1557011002	创造性思维与创新方法 ‖Creative Thinking and Innovative Methods	1.0	16							2						
			1740011001	创业基础 ‖Entrepreneurial Foundation	1.0	16	16							2					
		心理健康类 Mental Health Courses	0510041001	大学生心理与健康教育 ‖Mental and Health Education for College Students	1.0	16	16				2								
		小计 Subtotal			43.5	816	576	144	24	72	12	18	12	14	6	3	3	2	
	选修 Optional			分为经济管理类（1）、美育类（2）、科学技术类（0）、四史（1）、传统文化（2）、中国与世界（2）课程类 6 个模块 每个模块最多选修 2.0 学分，每学期最多选修 2 门课程。 Including 6 modules: Economic Management（1）, Aesthetic Education（2）, Science and Technology（0）, Four Histories（1）, Traditional Chinese Culture（2）, China and The world（2）. Up to2.0 credits per module and up to 2 courses per semester.															
		小计 Subtotal			8														
集中	实践 Practice		0415102011	军训 ‖military training	2.0	48				48	+2								集中

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
				合计 Total	52.5														
学科平台课 Discipline Education	必修 Compulsory	数学与自然科学类 Natural Science & Mathematics	0310004101	高等数学 I* ‖Advanced Mathematics I*	4.5	80	72			8	6								
			0310005201	高等数学 II* ‖Advanced Mathematics II*	5.5	96	88			8		6							
			0310032001	线性代数 ‖ Linear Algebra	2.0	32	32				3								
			0310042001	概率论与数理统计 ‖Probability and Statistics	2.0	32	32							2					
			1510251002	复变函数 ‖Function of Complex Variable	1.5	24	24					2							
			1511331002	近代物理学 ‖Modern Physics	1.0	16	16						2						
			0310063101	大学物理 I* ‖University Physics I*	3.0	48	46	2				3							
			0310063201	大学物理 II* ‖University Physics II*	3.0	48	46	2					3						
		工程基础类 Foundation Engineering	1510163002	电路分析基础* ‖ Fundamentals of circuit analysis *	3.5	56	56					4							
			1510913002	模拟电子技术* ‖Analog electronic* technology	3.5	60	48	12					3						
			1510923002	数字电子技术* ‖Digital Electronic Technology*	3.5	60	48	12						3					
			1514992002	微机原理及应用 ‖Microcomputer Principle and Application	2.5	42	36	6							3				
			1510141002	电气工程制图及 CAD ‖Electrical Engineering Drawing and CAD	1.5	26	20			6		2							

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
学科平台课 Discipline Education	必修 Compulsory	专业基础类 Subject Foundation Requisite	1111042002	化学工艺学 ‖ Chemical Process Technology	2.0	32	32						3						
			1511364002	自动控制原理* ‖The Principle of Automatic Control*	4.0	68	56	8	4					4					
			1513231002	测控技术与仪器专业概论 ‖ Introduction to the Specialty of Measurement and Control Technology and Instrument	1.0	18	12	6			2								
			1514882002	信号与系统I* ‖Signals and Systems I*	2.5	42	36	6					3						
			1513272002	算法与数据结构 ‖Algorithm and Data Structure	2.5	44	32		12				3						
			1513881102	测控专业外语 ‖Specialty English for Measurement & Control Technology and Instrument	1.0	16	16									2			
			1513841302	测控专业科技论文写作与文献检索 ‖Scientific Paper Writing and Literature Searching for Measurement /Control Technology and Instrument	1.0	16	16										2		
				小计 Subtotal	51	856	764	54	22	16	11	17	14	12	5	2			
	实践 Practice		0310081011	大学物理实验 ‖Physical experiment of college	1	24	6	18					3						分散
			1410071031	金工实习 ‖Metalworking Practice	1	24		24				+1							集中
			1513162032	生产实习 ‖Production Practice	2	48		48									+2		集中

课程类别 Course Type	课程性质 Course Nature	课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	备注 Notes
学科平台课 Discipline Education	实践 Practice	1512212032	电子工艺实习 ‖Electronic Process Practice	2	48		48					+2						集中
		1510141024	电子技术课程设计 ‖Course Design with Electronic Technique	1	24		24						+1					集中
		1514242022	工程数学实践 ‖Engineering Mathematics Practice	2	48		48						+2					集中
		1510150012	电路分析基础实验 ‖Circuit Analysis Experiment	0.5	12		12				√							分散
		1513261022	虚拟仪器课程设计 ‖Design of Virtual instrument	1.5	36		36								+1.5			集中
		1513181022	电子线路辅助设计课程设计 ‖Assistant Design of Electronic Circuit	1.5	36		36							√				分散
			小计 Subtotal	12.5	300	6	294											
合计 Total				63.5	1156	770	348	22	16									
专业教育课 Specialized Education	必修 Compulsory	1513032002	传感器原理及应用* ‖Sensor Principle and Application*	2.5	42	36	6							3				
		1513022002	误差理论与数据处理 ‖Error Theory and Data Processing	2.0	32	32								3				
		1523733002	化工过程检测技术及仪表* ‖Chemical Process Detection Techniques and Sensors*	3.0	50	44	6								3			
		1523963002	智能仪表原理及设计* ‖The Design and Principal of Intelligent Instrument*	3.5	60	48	12							3				
		1526092002	嵌入式系统 ‖The Embedded System	2.5	46	28	18								2			
		1511413002	计算机控制技术* ‖Computer Control Technology*	3.0	52	40	12								3			

课程类别 Course Type	课程性质 Course Nature	课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
						讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
专业教育课 Specialized Education			小计 Subtotal	16.5	282	228	54							9	8			
	选修 Optional	1531033002	现代控制理论 ‖Modern Control Theory	3.0	52	40	8	4							3			
		1534863002	大数据原理与技术 ‖Principle and Technology of Big Data	3.0	56	32		24							4			
		1531992002	仿真技术 ‖ Simulation Technology	2.0	36	24		12					2					
		1533912002	FPGA 原理及设计 ‖Principle and Design of FPGA	2.0	36	24	12								2			
		1537042002	计算机网络与通信技术 ‖Computer Network and Communication Technology	2.0	32	32							2		2			
		1538563002	ZigBee 技术应用及无线传感器网络 ‖ZigBee Technology and Wireless Sensor Networks	3.0	52	40	12							3				
		1534962002	C#程序设计 ‖C# Program Design	2.0	36	24		12				2						
		1534862002	数字信号处理器原理及应用 ‖Principle and Application of Digital Signal Processors	2.0	36	24		12							2			
		1534872002	语音信号处理 ‖Speech Signal Processing	2.0	36	24		12							2			
		1534932002	面向对象程序设计 ‖Object-oriented Programming	2.0	36	24		12			2							
			小计 Subtotal	23	408	288	32	88			2	2	5	2	6			
			修读要求 Fill in the Study Requirements	4.0														
	实践 Practice	1513292022	智能仪表课程设计 ‖ The Course Design of Intelligent Instrument	2	48			48							√			分散

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	备注 Notes
专业教育课 Specialized Education	实践 Practice		1513912022	化工过程检测技术及仪表综合实训 ‖Comprehensive Training of Chemical Process Detection Technology and Instrumentation	2	48		48									+2		集中
			1513102022	机器人课程设计 ‖The Course Design of robot	2	48		48									√		分散
			1513062022	智能测控综合实训 Comprehensive Training of Intelligent Measurement and Control	2	48		48									√		分散 CDIO课程
			1513174042	毕业设计（论文）‖Graduation Design（Thesis）	14													+17	集中
				小计 Subtotal	22	192		192											
合计 Total					42.5														
能力拓展课 Competency Development	必修或实践 Compulsory or Practice		1512061002	可编程控制器原理与应用 ‖The Principle and Application of Programmable Controller	1.5	26	20	6								2			
			1524482002	Python 机器学习 ‖Python Machine Learning	2.5	48	24		24						2				
			1523992002	机器人控制 ‖ Robot control	2.0	36	24	12								2			
			1513012002	虚拟仪器基础 ‖ Fundamentals of virtual instrument	2.0	36	24	12							2				
				小计 Subtotal	8.0	146	92	30	24						4	4			
修读要求 Fill in the Study Requirements 8.0																			
总计 Sum					167.5						17.5	30	22	25	21.5	22.5	15	16	
课外环节 Extracurricular	课外实践 Extracurricular practice	人文社会实践 Culture and Society Practice	1513401032	社会调查 ‖Social Survey	0.5	12				12								0.5	分散

课程类别 Course Type	课程性质 Course Nature		课程号 Course Code	课程名称 Course Name	学分 Cre.	总学时数 T.C.H	学时分配 Credit Hour Distribution				各学期周学时分配 Weekly Hours Per Semester								备注 Notes
							讲课 Lec.	实验 Exp.	上机 Pro.	课外实践 Pra.	一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
课外环节 Extracurricular	课外实践 Extracurricular practice	身心健康社会实践 Mentally and Physically Practice	0410050751	课外体育锻炼 ‖Extracurricular Physical Exercise	0.5	12				12							0.5		分散
			2640030011	劳动教育实践 ‖Labour Education Practice	0.5	12				12		0.5							分散
			0510070311	心理健康辅导 ‖Mental Health Counseling	0.5	12				12							0.5		分散
		外语技能实践类 Foreign Language Proficiency Training Practice	0210010011	外语技能实践（初级） ‖Foreign Language Proficiency Training Practice（elementary）	2.0	48				48				2					二选一
			0210020011	外语技能实践（高级） ‖Foreign Language Proficiency Training Practice（advanced）	2.0	48				48				2					二选一
		成长规划类 Growth Planning Courses	1510271312	职业规划与就业指导 ‖Career Planning and Employment Guidance	1.0	40	40				1					1			
		能力与创新实践 Capability and Innovation Practice	1513414022	大学生素质拓展与创新实践 ‖Quality Development and Innovation Practice	4.0	96				96	1～8 学期依据《沈阳化工大学创新创业实践学分认定办法》由创新创业学院认定								分散
小计 Subtotal																			

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

十、测控技术与仪器专业学士学位课程一览表

A list of bachelor's degree programs in Measurement and control technology and instrument Major

课程类别 Course Type	模块名称 Modules	序号 No.	课程编号 Course Codes	课程名称 Course Name	学分 Credits	开课学期 Semester
通识教育课 General Education	政治理论 Political Theory	1	0710103001	马克思主义基本原理* Elementary Theory of Marxism	3	3
		2	0710133001	毛泽东思想和中国特色社会主义理论体系概论* Mao Zedong Thought and Theory of Socialism with Chinese Characteristics*	3	4
学科平台课 Discipline Education	数学 Mathematics	3	0310004101	高等数学I* Advanced Mathematics I*	4.5	1
	物理 Physics	4	0310063101	大学物理I* University Physics I*	3	2
	工程基础类 Foundation Engineering	5	1510923002	数字电子技术* Digital electronic technology	3.5	4
		6	1514992002	微机原理及应用* Microcomputer Principle and Application	2.5	5
		7	1510163002	电路分析基础* Circuit Analysis	3.5	2
	专业基础 Subject Foundation Requisite	8	1511364002	自动控制原理* The Principle of Automatic Control	4	4
		9	1513032002	传感器原理及应用* Sensor Principle and Application	2.5	5
		10	1513022002	误差理论与数据处理 Error Theory and Data Processing	2	5
		11	1514882002	信号与系统I* Signals and Systems I	2.5	3
专业教育课 Specialized Education	智能测控类	12	1523063002	智能仪表原理及设计* The Design and Principal of Intelligent Instrument	3.5	5
		13	1526092002	嵌入式系统 The Embedded System	2.5	6
		14	1511413002	计算机控制技术* Computer Control Technology	3	6
		15	1523733002	化工过程检测技术及仪表* Chemical Process Detection Techniques and Sensors	3	6

说明：关于学士学位课的具体要求见《沈阳化工大学关于学士学位课程水平审核制度的若干规定》

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

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

符号说明(Symbol Description)：

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