

机械工程学院 测控技术与仪器专业 2021级 培养方案

1. 专业介绍

本专业培养具有精密仪器设计制造以及测量与控制方面基础知识与应用能力，能在以轨道交通为主的领域里从事测量与控制有关技术、仪器与系统的设计制造、科研开发、应用研究、运行管理等方面的复合型工程技术人才。

专业起源于1989年批准成立的测控技术与仪器专业（大专），1993年获批测控技术与仪器专业（本科）。专业自建立以来，为测控技术与仪器和轨道交通装备行业培养了一千多名本科人才。

The professional development of design and manufacture precision instruments and measurement and control the basic knowledge and application ability, can in the field of predominantly rail transit field in concerned in the field of measurement and control technology, equipment and system design and manufacturing, scientific research and development, application research and operation management of engineering and technology talents.

The specialty originated from the measurement and control technology and instrument major approved in 1989 (junior college), and was approved in 1993 (bachelor's degree). Since the establishment of this speciality, more than 1,000 undergraduate talents for the measurement and control technology and instrument and rail transit equipment industry.

专业代码：080301

Program Code: 080301

专业名称：测控技术与仪器

Program Name: Measurement and control technology and instrumentation

2. 培养目标

立足于轨道交通装备行业，面向仪器科学与技术领域，培养掌握数学、自然科学和工程科学的基础理论以及测控技术与仪器专业知识，具有良好的人文素养、职业素质、国际视野、创新精神和社会责任感，具备综合运用知识和技能解决仪器科学与技术领域和轨道交通装备领域的复杂工程问题的能力，能够在仪器科学与技术及轨道交通装备行业从事信息检测、信息处理、信息传输、故障诊断、自动控制相关技术、仪器的设计制造、科研开发、系统集成、运行管理等方面工作的复合型工程技术人才。毕业后通过专业实践和学习深造，成为卓越的工程师、优秀的研究人员以及轨道交通装备领域的行业领军人才。

毕业5年应达到的目标：在专业技能和职业素养方面达到工程师水平，能够以工程师、技术骨干或者研究人员的身分解决仪器科学与技术领域的复杂技术问题，并具备成长为高级工程师、行业专家和高级研究人才的潜力。

Based on the requirements of the rail transit equipment industry and the mechanical engineering discipline, this speciality aims to cultivate excellent engineers and technicians who understand the basic theories of mathematics, natural science and engineering sciences as well as the professional knowledge of the measurement

and control technology and instrumentation , who has good humanistic quality, professional quality, international perspective, innovative spirit and social responsibility, who has the ability to solve complex engineering problems in the fields of instrument science and technology and rail transit equipment by making comprehensive use of the knowledge and skills, and who are able to conduct information detection, information processing, information transmission, fault diagnosis, automatic control related technology, instrument design and manufacturing, scientific research and development, system integration, operation management and other works relevant to the instrument science and technology and rail transportation equipment industries. He or she would become a distinguished engineer, an excellent researcher, or an industry leader of the rail transportation equipment field after graduation by pursuing professional practices and further studies.

The goal to achieve in the 5 years of graduation: achieving the professional skills and professionalism of the engineer level, solving complex technical problems in the field of instrument science and technology as engineers, technical backbones or researchers, and becoming an candidate to be senior engineers, industry experts and senior researchers.

3. 专业毕业要求

为达成本专业的培养目标，学生毕业时在知识、能力和素质三个方面应达到规定的要求。知识结构方面需要掌握数学、自然科学、工程科学和测控技术与仪器专业的基础理论和方法，并具备测控技术与仪器专业系统的专业知识和技能。能力结构方面应具备在考虑多种外部因素的情况下，对机械工程领域的设计、制造和控制等技术问题进行分析、设计、研究的能力，学生还应具备较强的系统观念、国际视野、创新思维、沟通交流和组织领导能力。职业素质方面应具备优良的思想品德、人文素养、职业规范和社会责任意识，能通过自主学习以适应社会发展和技术进步。

In order to achieve the training objectives of this major, students should meet the required requirements in knowledge, ability and quality when they graduate. In terms of knowledge structure, students need to master the basic theories and methods of mathematics, natural science, engineering science and measurement and control technology and instrument, and have the professional knowledge and skills of major in measurement and control technology and instrument. In terms of ability structure, students should have the ability to analyze, design and research technical problems such as design, manufacturing and control in mechanical engineering field, taking into account various external factors. Students should also have strong system concept, international vision, innovative thinking, communication and organizational leadership. In terms of vocational quality, students should have excellent ideological and moral character, humanistic quality, professional norms and social responsibility consciousness, and be able to adapt to social development and technological progress through independent learning.

知识结构要求:

Requirements of knowledge structure:

1. 掌握数学、自然科学与工程科学的基础理论以及测控技术与仪器专业知识，并能用于分析解决仪器科学与技术领域中的设计、开发和应用工作中所面临的复杂工程问题。

1. Master the basic theory of mathematics, natural sciences and engineering sciences, as well as the professional knowledge of the measurement and control technology and instrument, and be able to use the knowledge to solve complex engineering problems such as design, manufacturing and control in the field of mechanical engineering.

能力结构要求:

Requirements of ability structure:

2. 分析能力。能够应用数学、自然科学和工程科学的基本原理和方法, 对设计、开发、应用等技术问题进行识别、表达、分析, 结合文献研究获得有效结论。

2. Analytical ability. The Graduates can apply the basic principles and methods of mathematics, natural sciences and engineering sciences to identify, express and analyze technical problems such as design, development and application, and obtain effective conclusions based on literature research.

3. 设计/开发能力。能够为仪器科学与技术领域的实际问题提出解决方案, 设计满足需求的系统、元件, 并能够在设计中体现创新意识, 考虑社会、健康、安全、法律、文化以及环境等因素。

3. Design/development capability. The Graduates can provide solutions to practical problems in the field of instrument science and technology, design systems, components to meet their needs, and embody innovative ideas in the design, taking into account social, health, safety, legal, cultural and environmental factors.

4. 研究能力。能够基于科学原理并采用科学方法对仪器科学与技术领域的实际问题开展科学研究, 包括实验设计、实验实施和实验数据处理与分析。

4. Research ability. The Graduates can conduct scientific research on practical problems in the field of instrument science and technology based on scientific principles and methods, including experimental design, experimental implementation and experimental data processing and analysis.

5. 现代工具使用能力。能够针对仪器科学与技术领域的实际问题, 开发、选择与使用恰当的技术、资源、现代工程工具和信息工具, 对设计、开发、应用等技术问题进行预测和数值模拟, 并能够理解其局限性。

5. Ability to use modern tools. The Graduates can develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for practical problems in the field of instrument science and technology, to predict and numerically simulate design, development, application and other technical problems, and to understand their limitations.

6. 处理社会、环境与可持续发展问题的能力。能够基于仪器科学与技术相关背景知识进行合理分析, 评价方案对环境、社会、健康、安全、法律、文化、环境以及可持续发展的影响, 理解并明确应承担的责任, 维护社会的可持续发展。

6. Ability to deal with social, environmental and sustainable development issues. The Graduates can make rational analysis based on relevant background knowledge of instrument science and technology., evaluate the impact of the program on environment, society, health, safety, law, culture, environment and sustainable

development, understand and clarify their responsibilities, and maintain the sustainable development of society.

7. 合作与组织能力。具有良好的团队合作意识和组织协调能力，能够在多学科背景下的技术团队中承担个体、团队成员以及负责人的角色。

7. Cooperation and organizational capacity. Good sense of teamwork and organizational coordination, able to assume the role of individual, team members and leaders in a multi-disciplinary technical team.

8. 沟通交流能力。具备良好的沟通表达、人际交往能力，能够就具体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。

8. Communication skills. Graduates have good communication and interpersonal skills, can effectively communicate and communicate with peers in the industry and the public on specific issues, including writing reports and designing manuscripts, presenting speeches, clearly expressing or responding to instructions, and have a certain international vision, and can communicate and respond to cross-cultural background.

Communication.

9. 项目管理能力。理解并掌握工程管理原理、经济学原理与决策方法，并能在仪器科学与技术领域内的具体项目中承担并完成项目管理任务。

9. Project management capability. The graduates can understand and master engineering management principles, economic principles and decision-making methods, and can undertake and complete project management tasks in specific projects in the field of instrument science and technology.

10. 学习能力。具有自主学习与终身学习的意识，具备独立学习，适应社会和技术发展的能力。

10. Learning ability. The graduates have the consciousness of autonomous learning and lifelong learning, and the ability to learn independently and adapt to the development of society and technology.

素质结构要求:

Requirements of qualification structure

11. 思想素质。具有良好的思想政治素质和科学的世界观、人生观、价值观，践行社会主义核心价值观。

11. Ideological quality. The graduates have good ideological and political quality, scientific world outlook, outlook on life and values, and can practice socialist core values.

12. 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。

12. Professional norms. The graduates have humanities and Social Sciences literacy and sense of social responsibility. They can understand and abide by engineering professional ethics and norms in engineering practice and fulfill their responsibilities.

13. 创新意识。具有创新意识、创业精神和批判性思维，并能在解决仪器科学与技术领域实际问题的所有环节中体现。

13. Innovation consciousness. The graduates have innovative consciousness, entrepreneurship and critical

thinking, which can be reflected in all aspects of solving practical problems in the field of instrument science and technology.

4. 学制与学位

学制: 4年 Duration: 4 Years

学位: 工学学士 Degree: Bachelor of Engineering

5. 主干学科与主干课程

主干学科: 仪器科学与技术、机械工程

Main Subject: Instrument Science and Technology, Mechanical Engineering

主干课程: 电路分析与模拟电子技术、数字电子技术、工程力学、机械工程制图、机械原理、精密仪器设计、误差理论与数据处理、电子设计自动化技术(EDA)、信号分析与处理、传感器与检测仪器电路、自动控制原理、微机原理与接口技术、嵌入式系统原理与技术、车辆主动控制技术、状态监测与故障诊断、工程测试分析与可视化、电机与运动控制、测控网络技术、轨道交通测试技术、精密测控与系统、工程经济与项目管理。

Main Course: Circuit Analysis and Analog Electronic Technology ,Digital Electronic Technology, Engineering Mechanics, Mechanical Engineering Drawing, Mechanisms and Machine Theory, Precision Instrument Design, Error and Data Analysis, EDA Technology, Signal Analysis and Processing, Sensor and Detection Instrument Circuit, Principle of automatic control, Microcomputer Principle and Interface Technology, Embedded System Principles and Technology, Vehicle active control technology, Condition Monitoring and Fault Diagnosis, Engineering Test Analysis and Visualization, Motor and Motion Control, Measurement and Control Network Technology, Rail transit Test Technology, Precision measurement and control system, Engineering Economy and Project Management.

6. 毕业学分基本要求

课程体系 Curriculum System		学分要求 Credits Requirements						
		必修 Compulsory		限修 Distributional Electives		选修 Free Electives		小计 Subtotal
		理论 Theory	实践 Practice	理论 Theory	实践 Practice	理论 Theory	实践 Practice	
	思想政治 类 Ideological	14	2					16

	Politics Courses							
公共基础课程 Public Basic Courses	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	数学与自然科学基础课 Foundational Courses on Mathematics and	26.5	2.5					29

and Specialty Foundational Courses (Including Experiments)	Natural Science 专业基础 课 Professional Foundational Courses	48	8					56
专业课程 (含实验) Specialized Courses (Including Experiments)	专业核心 课程 Specialized Core Course	10	2					12
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		18					18

	Internship and Graduation Design							
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	2		2				4
创新创业实践 Innovation and Entrepreneurship	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,				2			2

Practice	Personalized Experiments, Subject Competition, Innovation Lectures, etc								
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									159

附录课程设置细化表

培养方案是大学期间学习的重要指导文件，如系统培养方案与学院下发的培养方案有差异，请以学院下发正式书面版为准。

课程大类	课程类型	课程名称	性质	学分	实践学分	开课	学年	学期
创新创业实践模块	创新创业实践	SWJTU00113课外创新实践	必	2.0	2.0	机械	4	2
		MECE008415产品质量控制	限	2.0	0.0	机械	4	1

多元化课程模块	多元化课程	MECE008515智能制造导论	限	2.0	0.0	机械	4	1
		DESI001415工业设计导论	必	2.0	1.0	设计	4	1
公共基础课程模块	军事类	PAFD000111军事理论	必	2.0	0.0	武装部	1	1
		PAFD000211军事技能	必	2.0	2.0	武装部	1	3
	思想政治类	MARX000111中国近现代史纲要	必	3.0	0.4	马院	1	1
		MARX000311形势与政策 I	必	0.0	0.0	马院	1	1
		MARX021911形势与政策 II	必	0.0	0.0	马院	1	2
		MARX000911思想道德与法治	必	3.0	0.4	马院	1	2
		MARX022011形势与政策 III	必	0.0	0.0	马院	2	1
		MARX022111形势与政策 IV	必	0.0	0.0	马院	2	2
		MARX021611马克思主义基本原理	必	3.0	0.4	马院	2	2
		MARX001011毛泽东思想和中国特色社会主义理论体系概论	必	3.0	0.4	马院	3	1
		MARX022211形势与政策 V	必	0.0	0.0	马院	3	1
		MARX022311形势与政策 V I	必	0.0	0.0	马院	3	2
		MARX001111习近平新时代中国特色社会主义思想概论	必	3.0	0.4	马院	3	2
		MARX022411形势与政策 V II	必	0.0	0.0	马院	4	1
	MARX022511形势与政策 VIII	必	2.0	0.0	马院	4	2	
	体育类	PHYE000111体育 I	必	1.0	1.0	体育	1	1
		PHYE000211体育 II	必	1.0	1.0	体育	1	2
		PHYE000311体育 III	必	0.5	0.5	体育	2	1
		PHYE000411体育 IV	必	0.5	0.5	体育	2	2
		PHYE000511体育健康课程 I	必	0.5	0.5	体育	3	1
PHYE000611体育健康课程 II		必	0.5	0.5	体育	3	2	
外语类	SoFL001511英语 I	必	2.0	0.0	外语	1	1	
	SoFL000512英语 II	必	2.0	0.0	外语	1	2	
	SoFL004411通用学术英语	必	2.0	0.0	外语	2	1	
	SoFL003911职场英语	限	2.0	0.0	外语	2	2	
	SoFL004011交际与文化视听说	限	2.0	0.0	外语	2	2	
	SoFL004111语言、文化与翻译	限	2.0	0.0	外语	2	2	
	SoFL004211英语公共演讲	限	2.0	0.0	外语	2	2	
		ENTC000313工程训练A	必	2.0	2.0	工业	1	2
		ELEC016313电路分析与模拟电子技术实验	必	1.0	1.0	电气	2	1

实习实践教学 模块	毕业实 习与毕 业设计	ELEC014412数字电子技术实验	必	1.0	1.0	电气	2	2
		MECE010913电子工艺实习	必	1.0	1.0	机械	2	3
		MECE008213专业认识实习	必	1.0	1.0	机械	3	3
		MECE010713测控系统综合设计与实践	必	2.0	2.0	机械	4	1
		MECE010813仪器与信号处理设计实践	必	2.0	2.0	机械	4	1
		MECE008313毕业设计(论文)	必	8.0	8.0	机械	4	2
通识教育课程 模块	新生研 讨类	MECE003114轨道交通现状及前沿技术	必	2.0	0.0	机械	1	2
		MECE003214现代企业管理与工业工程	必	2.0	0.0	机械	1	2
		MECE003314现代起重与工程机械技术	必	2.0	0.0	机械	1	2
		MECE003414机电液一体化技术导论	必	2.0	0.0	机械	1	2
		MECE003514机器人导论	必	2.0	0.0	机械	1	2
		MECE003614高端机械装备漫谈	必	2.0	0.0	机械	1	2
		MECE003714仿生机械	必	2.0	0.0	机械	1	2
		MECE003814微纳先进制造前沿	必	2.0	0.0	机械	1	2
		MECE004214二十一世纪的制造技术	必	2.0	0.0	机械	1	2
		MECE004314测控技术导论	必	2.0	0.0	机械	1	2
		MECE024914机械科学与技术史	必	2.0	0.0	机械	1	2
		MECE024814人工智能与优化设计	必	2.0	0.0	机械	1	2
		MECE004314测控技术导论	必	2.0	0.0	机械	1	2
数学与 自然科 学基础 类	数学与 自然科 学基础 类	MATH000812高等数学 I	必	5.0	0.0	数学	1	1
		SLSE001012工程化学C	必	2.0	0.5	生命	1	1
		PHYS001112大学物理B I	必	3.0	0.0	物理	1	2
		PHYS000712大学物理实验 I	必	1.0	1.0	物理	1	2
		MATH011512高等数学 II	必	5.0	0.0	数学	1	2
		MATH000112线性代数B	必	3.0	0.0	数学	1	2
		MATH001612概率论与数理统计	必	3.0	0.0	数学	2	1
		MATH001912复变函数与积分变换	必	3.0	0.0	数学	2	1
		PHYS000812大学物理实验 II	必	1.0	1.0	物理	2	1
		PHYS001212大学物理B II	必	3.0	0.0	物理	2	1
		MECE001212机械工程概论	必	1.0	0.5	机械	1	1
		MECE001412轨道交通概论	必	1.0	0.5	机械	1	1
		SCAI000512计算机程序设计基础	必	3.0	1.0	计算 机	1	1
		MECE001112机械工程制图 I	必	2.0	0.0	机械	1	1

学科与专业基础课程模块	专业基础类	MECE004412机械工程制图 II	必	3.0	1.0	机械	1	2
		ELEC016112电路分析与模拟电子技术B	必	3.0	0.0	电气	2	1
		MECH000612工程力学C	必	3.0	0.0	力航	2	1
		MECE004812机械原理A	必	4.0	0.0	机械	2	2
		ELEC016212数字电子技术C	必	3.0	0.0	电气	2	2
		MECE009312误差理论与数据处理	必	3.0	0.0	机械	2	2
		MECE009412电子设计自动化技术(EDA)	必	3.0	1.0	机械	3	1
		MECE009512信号分析与处理	必	3.0	0.0	机械	3	1
		MECE009612传感器与检测仪器电路	必	3.0	1.0	机械	3	1
		MECE009812微机原理与接口技术	必	3.0	1.0	机械	3	1
		MECE009212精密仪器设计	必	3.0	0.0	机械	3	1
		MECE009912嵌入式系统原理与技术	必	3.0	1.0	机械	3	2
		MECE009712自动控制原理A	必	4.0	0.0	机械	3	2
		MECE010112状态监测与故障诊断	必	3.0	0.0	机械	3	2
		MECE010212工程测试分析与可视化	必	3.0	1.0	机械	3	2
		MECE010012车辆主动控制技术	必	2.0	0.0	机械	4	1
专业课程模块	专业核心类	MECE005612电机与控制	必	2.0	1.0	机械	3	2
		MECE005812工程经济与项目管理	必	2.0	0.0	机械	3	2
		MECE010412测控网络技术	必	2.0	0.0	机械	4	1
		MECE010512轨道交通测试技术	必	3.0	1.0	机械	4	1
		MECE010612精密测控与系统	必	3.0	0.0	机械	4	1