机械工程学院 机械设计制造及其自动化(茅以升班)专业 2021级 培养方案

2. 培养目标

本专业设立卓越班，就是要以轨道交通装备为基础，辐射全社会相关行业，面向整个机械工程领域，以“厚实基础重实践、面向前沿求创新”的办学思路，树立“面向工业界、面向未来、面向世界”的工程教育理念，以学生为中心，以社会人才需求和未来科技发展为导向，以实际工程为背景，强调学生知识、能力和素质的协调统一发展，并具备以人工智能和信息技术为特点的智能装备方向的系统知识和技能。

The establishment of excellent classes in this major is to take rail transit equipment as the basis, radiate the relevant industries of the whole society, face the whole field of mechanical engineering, take the idea of "solid foundation, emphasizing practice, facing the frontier and seeking innovation", establish the concept of engineering education "facing industry, the future and the world", take students as the center, take the demand of social talents and the future development of science and technology as the center. Guided by practical engineering, it emphasizes the coordinated and unified development of students' ability in the aspects of knowledge, ability and quality, and enables them to possess systematic knowledge and skills in the direction of intelligent equipment characterized by artificial intelligence and information technology.

所以本专业（卓越班）的培养目标为：

以轨道交通装备为基础，面向制造强国的智能装备方向人才需求，满足智能装备的设计与制造、绿色制造技术需要，培养掌握数学、自然科学、计算与工程基础和机械设计制造及自动化专业知识，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，掌握深度融合在机械工程领域的新一代信息与人工智能技术,具有综合应用机械设计制造及自动化专业基础知识和技术，发现、分析和解决复杂机械工程问题的技术创新能力，以及素质拓展和持续发展所需要的自我学习能力的创新型高级工程技术、科学研究和项目管理人才。

Therefore, the training objectives of this major (excellent class) are:

On the basis of rail transit equipment, facing the demand of intelligent equipment direction talents of powerful manufacturing countries, meeting the needs of intelligent manufacturing and green manufacturing technology, training senior engineering engineers, scientific researchers and project management personnel with the following abilities: mastering the professional knowledge of mathematics, natural science, engineering foundation, mechanical design, manufacture and automation, having good humanistic accomplishment, professional quality, international vision, innovative spirit and social responsibility, mastering the new generation of information and artificial intelligence technology deeply integrated in the field of mechanical engineering, such as machine vision, Internet of Things, etc., possessing the technical innovation ability of combining the basic knowledge and technology of mechanical design, manufacturing and automation to discover, analyze and solve the complex mechanical engineering problems, as well as the self-learning ability needed for quality development and sustainable development.

本专业学生毕业5年后应达到以下目标：

1.掌握自然科学、工程科学和机械工程专业的基础理论方法和前沿技术，尤其是人工智能技术的应用，能够在考虑多种外部因素的条件下，针对设计、制造和控制等技术问题进行分析、设计、研究，解决实际工程问题。

2.具备较强的系统观念、国际视野、创新思维、沟通交流能力，能组织和管理团队，在工程实践中推动技术进步。

3.具备优良的思想品德、人文素养、职业规范和社会责任意识，能通过终身学习以适应社会发展和技术进步。

Students of this major should achieve the following goals when they graduate:

1. To master the basic theoretical methods and cutting-edge technologies of natural science, Engineering Science and mechanical engineering, especially the application of artificial intelligence technology, can analyze, design and research the technical problems of design, manufacturing and control, taking into account various external factors, to solve practical engineering problems.

2. Have strong system concept, international vision, innovative thinking, communication and organizational leadership to promote technological progress.

3. Have excellent ideological and moral character, humanistic accomplishment, professional norms and social responsibility consciousness, and can adapt to social development and technological progress through lifelong learning.

即毕业五年后，通过工程实践和继续学习深造，能成为卓越工程师、优秀研究人员以及机械工程领域的智能装备方向领军人才。

Five years after graduation, through engineering practice and further study, we can become outstanding engineers, outstanding researchers, and leaders in the direction of intelligent equipment for rail transit and other industries.

3. 专业毕业要求

机械设计制造及其自动化专业的毕业生应在知识、能力和素质三个方面达到以下要求:

Graduates majoring in mechanical design, manufacturing and automation should meet the following requirements in terms of knowledge, ability and quality:

知识要求

1.具有解决复杂机械工程问题的数学、自然科学、机械工程基础和专业知识，并能将其应用于解决复杂机械工程问题。

Knowledge requirements

1.Have the basic knowledge of mathematics, natural science, mechanical engineering and professional knowledge to solve complex mechanical engineering problems, and can apply it to solve complex mechanical engineering problems.

能力要求

2. 问题分析能力：能应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析复杂机械工程问题，以获得有效结论。

3. 设计/开发能力：能设计针对复杂工程问题的解决方案和满足特定需求的系统、零部件、设备或制造工艺，并在设计中体现创新意识，考虑社会、环境、健康、安全、法律、文化等因素。

4. 研究能力：能基于科学原理并采用科学方法对复杂机械工程问题进行研究，包括设计实验方案、进行实验、分析与解释数据，并通过综合理论分析、实验数据和文献研究得出合理有效结论。

5. 使用现代工具能力：能针对复杂机械工程问题，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，包括对复杂机械工程问题的预测与模拟，并能够理解其局限性。

6. 处理工程与社会关系能力：能基于机械工程相关背景知识进行合理分析、评价本专业的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。

7. 可持续发展影响分析能力：能理解和评价针对机械工程问题的工程实践对环境、社会可持续发展的影响。

Capacity requirements

2. Problem Analysis Ability: Applying the basic principles of mathematics, natural science and engineering science, identifying, expressing and analyzing complex mechanical engineering problems through literature research, in order to obtain effective conclusions.

3. Design/Development Ability: Ability to design solutions to complex engineering problems and systems, components, equipment or manufacturing processes to meet specific needs, and to reflect innovative awareness in design, taking into account social, environmental, health, safety, legal and cultural factors.

4. Research Ability: Ability to study complex mechanical engineering problems based on scientific principles and methods, including designing experimental schemes, conducting experiments, analyzing and interpreting data, and drawing reasonable and effective conclusions through comprehensive theoretical analysis, experimental data and literature research.

5. The ability to use modern tools: to select and use appropriate technology, resources, modern engineering tools and information technology tools for complex mechanical engineering problems, including prediction and Simulation of complex mechanical engineering problems, and to understand their limitations.

6. Engineering and social competence: Ability to rationally analyze and evaluate the impact of engineering practice and complex engineering problem solutions on society, health, safety, law and culture based on relevant background knowledge of mechanical engineering, and to understand the responsibilities to be undertaken.

7. Environment and Sustainable Development Ability: Ability to understand and evaluate the impact of engineering practices on environmental and social sustainable development for mechanical engineering problems.

素质要求

8. 职业规范：具有人文社会科学素养、社会责任感，能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：能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. 沟通能力：能就复杂机械工程问题与业界同行及社会公众进行有效沟通，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，能在跨文化背景下进行沟通。

11. 项目管理：理解并掌握工程管理原理和经济决策方法，并能在多学科环境中应用。

12. 终身学习：具有较强的终身学习意识和不断学习、适应社会经济和工程技术发展的能力。

Quality Requirements

8. Professional norms: with humanities and Social Sciences literacy, social responsibility, can understand and abide by engineering professional ethics and norms in engineering practice, fulfill their responsibilities.

9. Individuals and Teams: Be able to play the roles of individuals, team members and leaders in a multidisciplinary team.

10. Communication skills: Ability to communicate effectively with industry counterparts and the public on complex mechanical engineering issues, including writing reports and designing manuscripts, presenting statements, expressing clearly or responding to instructions. And have a certain international perspective, can communicate in cross-cultural context.

11. Project Management: Understand and master the principles of engineering management and economic decision-making methods, and can be applied in a multidisciplinary environment.

12. Lifelong learning: with a strong awareness of lifelong learning and continuous learning, to adapt to the development of social economy and engineering 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：机械工程、力学、控制科学与工程

Main Subject： Mechanical Engineering，Mechanics，Control Science and Engineering

主干课程：理论力学、材料力学、流体力学、热工基础、设计制图及CAD 、 制造工程、机械原理、机械设计、有限元法及应用、流体传动与控制、控制工程基础、测试技术基础、 电机与控制、嵌入式系统、机械振动与控制、机器人技术、工业总线与物联网、机器视觉技术、机器学习与数据挖掘

Main Course：Theoretical mechanics, Mechanics of materials, Fluid mechanics, Fundamentals of Thermo-technology, Design Drawing and CAD, Manufacturing engineering Theory of machines, Machine design, Finite element method and application, Fluid transmission and control, Basis of control engineering, Fundamentals of testing technology, Motor and control, Embedded system, Mechanical Vibration and Control, Technology of robots, Industrial bus and Internet of things, Machine vision technology, Machine learning and data mining.

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	
公共基础课程 Public Basic Courses	思想政治类 Ideological Politics Courses	14	2					16
	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 Foundation Courses(Including Experiments)	数学与自然科学基础课 Foundation Courses on Mathematics and Natural Science	30	3					33
	专业基础课 Professional Foundation Courses	48	19					67
专业课程（含实验） Specialized Courses(Including Experiments)	专业核心课程 Specialized Core Course	4	3					7
	专业限修课程							

	Specialized Restricted Courses			4	2			6
实习实践教学 Practice Courses	基本技能训练、实习、实训、创新创业实践、项目开发、毕业设计 Basic Skills Training, Practical Training, Factory Internship, Development of Project, and Graduation Design	0	16					16
多元化课程 Diversified Courses	综合经济类、管理类、美育类、人文社科类课程等 Inter-disciplinary Course and Integrated with Economics,			3	1			4

	Management, Art Education, Humanities and social sciences, etc.							
创新创业实践 Innovation and Entrepreneurship 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	大学生综合素质提升、学生体质达标测评 Comprehensive Quality Improvement Courses for	0	0					0

Part	College Students, Assessment of Students'' Physical Fitness							
总　计　173学分，其中实践类学分　52学分 Total Credits of 173, Including Practical Credits of 52								173

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
多元化课程模块	多元化课程	MECE005812工程经济与项目管理	限	2.0	0.0	机械	3	2
		SoAD026915工业设计导论	限	2.0	1.0	建筑	3	2
		MECE008415产品质量控制	限	2.0	0.0	机械	4	1
	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

公共基础课程模块		MARX022311形势与政策VⅠ	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VⅡ	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
实习实践教学模块	毕业实习与毕业设计	ENTC000313工程训练A	必	2.0	2.0	工业	1	2
		MECE021413机械测绘实践	必	1.0	1.0	机械	1	3
		MECE023713企业实习	必	1.0	1.0	机械	2	3
		MECE021513机电设备综合设计实践	必	1.0	1.0	机械	3	3
		MECE023813智能产线及管控系统开发实践	必	3.0	3.0	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	MECE024714机电装备中的智能技术导论	必	2.0	0.0	机械	1	1
	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
		MATH000112线性代数B	必	3.0	0.0	数学	1	1
		SLSE001012工程化学C	必	2.0	0.5	生命	1	1
		MATH011512高等数学Ⅱ	必	5.0	0.0	数学	1	2
		PHYS009012大学物理MⅠ	必	4.0	0.0	物理	1	2
		PHYS009212大学物理实验MⅠ	必	1.0	1.0	物理	1	2
		MATH001612概率论与数理统计	必	3.0	0.0	数学	2	1
		PHYS009112大学物理MⅡ	必	4.0	0.0	物理	2	1
		PHYS009312大学物理实验MⅡ	必	1.0	1.0	物理	2	1

		MATH001912复变函数与积分变换	必	3.0	0.0	数学	2	2
学科与专业基础课程模块	专业基础类	MECE007112设计制图及CAD Ⅰ	必	2.0	0.5	机械	1	1
		SoEM014614高铁经济学导论	必	2.0	0.0	经管	1	1
		MECE007212设计制图及CAD Ⅱ	必	3.0	1.0	机械	1	2
		MECE002412铁道机车车辆概论	必	2.0	0.0	机械	1	2
		MECH000412理论力学B	必	4.0	1.0	力航	1	2
		ELEC015912电工技术B	必	3.0	1.0	电气	2	1
		MECE022012工程材料(全英文)	必	2.0	0.5	机械	2	1
		MECH000712材料力学B	必	4.0	1.0	力航	2	1
		MECE022512制造工程	必	4.0	1.0	机械	2	1
		ELEC016012电子技术B	必	3.0	1.0	电气	2	2
		MECE022112机械原理B	必	3.0	0.5	机械	2	2
		MECE022312测试技术基础(全英文)	必	3.0	1.0	机械	2	2
		SCAI000512计算机程序设计基础	必	3.0	1.0	计算机	2	2
		MECE004712热工基础	必	3.0	0.5	机械	3	1
		MECE022212机械设计B	必	3.0	0.5	机械	3	1
		MECE005112控制工程基础	必	3.0	1.0	机械	3	1
		MECE005512流体传动与控制(双语)	必	3.0	0.5	机械	3	2
		MECE022912机械振动与控制(双语)	必	2.0	1.0	机械	3	2
		MECE022412自动化控制系统	必	2.0	0.5	机械	3	2
		MECE022612工程分析软件(全英文)	必	3.0	1.0	机械	3	2
		MECE022712工业总线与物联网	必	2.0	1.0	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	1
		MECE005912有限元法及应用	必	2.0	1.0	机械	3	1
		MECE022812机器智能与机器视觉	必	3.0	1.0	机械	4	1
	专业限修类	MECE023312智能装备数字化设计	限	3.0	1.0	机械	3	2
		MECE023512轨道车辆构造与原理	限	3.0	1.0	机械	3	2
		MECE023212智能制造与机器人技术	限	3.0	1.0	机械	4	1
		MECE023412轨道车辆强度及动力学	限	3.0	1.0	机械	4	1