

中国地质大学（武汉） 自动化专业 2023版培养方案

（适用于我校自动化专业 2023-2026级本科生）

自动化专业培养方案

专业名称与代码：自动化 080801

专业培养目标：

本专业为适应国民经济建设和社会进步发展需求，以立德树人为根本目标，培养具有品德高尚、健全人格、社会责任感和良好的科学、文化素养的德智体美劳全面发展的社会主义合格建设者和可靠接班人。培养学生系统掌握自动化专业领域相关基础理论、专业知识和基本技能，能够成为运动控制/过程控制、智能地学装备与仪器、人工智能与大数据技术、机器人技术、计算机控制系统等领域从事系统分析与设计、系统与装备制造与实施、系统测试与运行、科学研究与技术开发、管理与决策等工作的宽口径工程应用型和研究型人才。

学生毕业五年左右预期具有如下能力：

1. 具有正确的价值观，良好的人文社会修养、科学和工程素养、职业道德、社会责任感、创新意识和能力，有为建设国家和社会主义努力奋斗的志向；
2. 能够适应现代自动化和人工智能技术的发展，融会贯通工程数理基本知识和自动化专业知识，对地学与地质工程等领域的自动化系统、工业企业自动化与信息化、智能制造与机器人和装备设计与开发涉及的复杂工程问题提供系统性的解决方案；
3. 能够运用现代工具和信息技术从事本领域相关系统和装备的设计、研究、开发、制造、测试和生产，具有较强的工程实践能力和创新意识，成为科研院所及企事业单位的专业技术人才和业务骨干；
4. 具备良好的团队协作能力、组织管理能力、沟通交流表达能力、国际化视野以及环境与可持续发展的意识；
5. 具有强健体魄、终身学习、自主学习、适应发展和劳动的意识和能力。

专业毕业要求

本专业的学生主要学习电子电路技术、控制理论、检测技术与仪表、过程控制原理/运动控制原理、人工智能与大数据、计算机软硬件与网络技术、嵌入式系统等方面的基本理论和基本知识，受到较好的工程实践基本训练，在自动化领域具备系统分析、设计、开发与研究、管理与决策的基本能力。

毕业生应达到以下知识、素质和能力等方面的要求：

毕业要求 1(工程知识)： 具有从事自动化工程所需的数学、自然科学、工程基础和专业基础知识，并能够综合应用这些知识解决自动化复杂工程问题。	指标点 1-1: 掌握从事自动化工程所需的数学基础知识，并能够针对复杂对象进行数学推演、建模和求解。
	指标点 1-2: 掌握从事自动化工程所需的物理学、工程图学等基础知识，并能针对自动化领域对象进行物理和机械特性分析与计算。
	指标点 1-3: 掌握与自动化工程设计开发相关的电路、电子技术、检测技术等原理和知识，并能够解决自动化复杂工程中涉及的电子电路特性推演、分析和设计的问题。

	<p>指标点 1-4: 掌握与自动化工程设计开发相关的计算机、网络等基础知识和程序设计语言, 并能够解决自动化复杂工程中算法设计、仿真模拟、软件开发等问题。</p>
<p>毕业要求 2 (问题分析): 能够应用数学、自然科学和工程科学的基本原理, 通过文献研究, 发现和准确描述自动化复杂工程问题, 获得有效自动化复杂工程问题解决方案。</p>	<p>指标点 1-5: 掌握自动化控制、人工智能、大数据等基础专业知识, 能够将专业知识和数学模型用于自动化复杂工程问题解决方案的比较与综合。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 2-1: 能运用数学、物理和工程科学的基本原理, 识别和判断自动化复杂工程问题的关键环节和参数。</p>
<p>毕业要求 4 (研究): 能够基于科学原理和方法, 通过文献调查分析, 对自动化复杂工程问题进行研究, 包括建模、设计、综合、实验、仿真、优化、分析与解释数据, 并通过信息综合得到合理有效的结论。</p>	<p>指标点 2-2: 能够正确使用数学、物理、知识、数据模型方法表达自动化复杂工程问题。</p>
<p>毕业要求 5 (使用现代工具): 能够针对自动化复杂工程问题, 开发、选择与使</p>	<p>指标点 2-3: 能够运用自动化专业知识分析问题, 会通过文献研究, 寻求解决问题的多种方案。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 2-4: 能够认识到解决自动化复杂工程问题有多种方案可选择, 在实践中验证方案的可行性, 获得有效结论。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 3-1: 掌握工程设计和产品开发基本设计/开发方法和技术, 能够使用自动化系统基本设计技术、人工智能和大数据手段, 了解影响设计的因素。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 3-2: 能够针对自动化系统特定需求完成单元(部件)与装置的设计。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 3-3: 能够完成自动化工程系统需求的控制算法、应用技术与实施的设计与开发。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 3-4: 能够进行自动化系统开发与实施, 在设计与实践环节中体现创新意识。</p>
<p>毕业要求 3 (设计/开发解决方案): 能够设计针对自动化复杂工程问题解决方案, 设计满足特定需求的系统、单元(部件)、算法、技术、装置, 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。</p>	<p>指标点 3-5: 能够在安全、健康、法律、文化和环境等因素的约束下, 对设计方案的可行性进行分析。</p>
<p>毕业要求 4 (研究): 能够基于科学原理和方法, 通过文献调查分析, 对自动化复杂工程问题进行研究, 包括建模、设计、综合、实验、仿真、优化、分析与解释数据, 并通过信息综合得到合理有效的结论。</p>	<p>指标点 4-1: 能够根据工程基础知识与科学原理, 通过开展文献调查研究, 针对自动化领域复杂工程的物理现象、元器件特性、单元性能进行分析和研究。</p>
<p>毕业要求 4 (研究): 能够基于科学原理和方法, 通过文献调查分析, 对自动化复杂工程问题进行研究, 包括建模、设计、综合、实验、仿真、优化、分析与解释数据, 并通过信息综合得到合理有效的结论。</p>	<p>指标点 4-2: 能够基于科学原理并采用科学方法、专业理论对自动化控制系统开发或集成中的关键问题设计研究路线, 进行分析、建模、设计和综合。</p>
<p>毕业要求 4 (研究): 能够基于科学原理和方法, 通过文献调查分析, 对自动化复杂工程问题进行研究, 包括建模、设计、综合、实验、仿真、优化、分析与解释数据, 并通过信息综合得到合理有效的结论。</p>	<p>指标点 4-3: 能够运用专业理论和技术, 针对自动化复杂工程问题, 设计实验方案, 构建和实施仿真与实验系统, 正确采集数据。</p>
<p>毕业要求 4 (研究): 能够基于科学原理和方法, 通过文献调查分析, 对自动化复杂工程问题进行研究, 包括建模、设计、综合、实验、仿真、优化、分析与解释数据, 并通过信息综合得到合理有效的结论。</p>	<p>指标点 4-4: 针对自动化系统实验和运行数据, 能够通过人工智能、大数据等方法进行信息分析与综合得到有效结论, 并科学解释数据。</p>
<p>毕业要求 5 (使用现代工具): 能够针对自动化复杂工程问题, 开发、选择与使</p>	<p>指标点 5-1: 了解自动化专业常用现代仪器、人工智能及大数据等信息技术工具、现代化工程工具和模拟软件的使用原理和方法, 并理解其适用范围和局限性。</p>

用恰当的技术、资源、现代工程工具和信息技术工具,包括对自动化复杂工程问题的预测与模拟,并能够理解其局限性。	指标点 5-2:针对自动化复杂工程问题,能够选择和使用恰当的仪器、信息资源、软件仿真工具,进行分析、计算与设计。
	指标点 5-3:能够开发设计满足特定需求的实验系统或工具,对自动化复杂工程问题进行模拟和预测,并分析其局限性。
毕业要求 6(工程与社会): 能够基于工程相关背景知识进行合理分析,评价自动化专业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,并理解应承担责任;	指标点 6-1:了解自动化工程相关领域的方针政策、法律法规、工程伦理、技术标准体系、知识产权、产业政策等,理解不同社会文化对自动化工程活动的影响。
	指标点 6-2:能够认知所设计自动化方案对社会、健康、安全、伦理、法律以及文化的影响,以及这些制约因素对项目的影响,并理解应承担的责任。
毕业要求 7(环境和可持续发展): 能够理解和评价针对自动化复杂工程问题的工程实践对环境、社会可持续发展的影响。	指标点 7-1:树立科学发展观,了解自动化领域国家环境保护相关政策法规,理解社会可持续发展的重要性、理念、内涵和意义。
	指标点 7-2:能够站在环境保护和可持续发展的角度思考自动化控制工程实践的可持续性,评价产品周期中可能对人类和环境造成的损害和隐患。
毕业要求 8(职业规范): 具有家国情怀、有意愿成为社会主义合格建设者和可靠接班人。具有人文社会科学素养和社会责任感,能够在自动化工程复杂系统设计、运行与维护过程中理解并遵守工程职业道德和规范,履行相应的责任。	指标点 8-1:形成正确的世界观、人生观,理解个人与社会的关系,了解中国国情,有意愿成为社会主义合格建设者和可靠接班人。
	指标点 8-2:具有人文社会科学素养、理解并自觉遵守工程职业道德和规范。
	指标点 8-3:能够在自动化工程复杂系统设计、运行与维护过程中履行并承担社会责任。
毕业要求 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。	指标点 9-1:了解多学科背景下团队的构成以及不同角色成员的职责,能与其他成员有效沟通。
	指标点 9-2:具有团队合作意识,能听取、协调、综合成员意见,并形成合理决定,能够在团队中独立、合作及领导解决问题。
毕业要求 10(沟通): 能够就自动化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、清晰表达回应指令。具备一定国际视野,能够在跨文化背景下进行沟通和交流。	指标点 10-1:针对自动化复杂工程问题,能够以口头或书面方式准确表达自己观点,并能与业界同行、社会公众进行不同领域的有效交流、回应质疑,能够理解和处理业界同行和社会公众交流的差异性。
	指标点 10-2:能知悉和跟踪自动化学科国内外发展趋势,具备一定的国际视野,理解和尊重世界不同文化的差异性和多样性、具备跨文化背景下的语言文字表达与专业沟通能力。

毕业要求 11 (项目管理) : 理解并掌握自动化工程管理原理与经济决策方法, 并能在多学科环境中应用。	指标点 11-1: 掌握工程项目中涉及的管理与经济决策方法, 了解工程及产品全周期、全流程的成本构成, 理解其中涉及的工程管理与经济决策问题。
	指标点 11-2: 能够在多学科环境下, 将工程管理原理和经济决策方法应用于自动化复杂工程问题的研究、设计、开发与实施的过程中。
毕业要求 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, 有良好的劳动意识和能力。	指标点 12-1: 具备自主和终身学习的意识, 以及持续学习的健康体魄。
	指标点 12-2: 能适应社会发展, 具备自主学习的能力, 能主动理解、归纳与提出问题。
	指标点 12-3: 具备良好的劳动意识和劳动能力。

毕业要求对培养目标的支撑

本专业毕业要求	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√	√		
毕业要求 2		√	√		
毕业要求 3		√	√		
毕业要求 4		√	√		
毕业要求 5		√	√		
毕业要求 6	√				
毕业要求 7				√	
毕业要求 8	√				
毕业要求 9				√	
毕业要求 10				√	
毕业要求 11			√	√	
毕业要求 12					√

主干学科: 控制科学与工程

专业核心课程: 电路理论、模拟电子技术、数字电子技术、计算机程序设计基础、自动控制原理、传感器原理及检测技术、过程控制原理与应用技术、运动控制理论与应用技术、嵌入式原理及应用、计算机网络与工业互联网、人工智能基础、智能制造大数据技术等。

主要专业实验: 电路与电子技术实验、自动控制理论实验、嵌入式系统技术实验、运动控制实验、过程控制实验、传感器原理及检测技术实验、网络与现场总线、智能技术实践等。

主要实践性教学环节: 包括电子技术综合实践、微控制器技术实习、计算机程序设计实践、控制理论综合实践、智能地球探测技术与虚拟仪器实践、地质钻进过程控制虚拟仿真实践、网络化过程控制系统项目综合实践、网络化运动控制与轨迹规划项目综合实践、智能制造大数据技术实践、智能系统技术实践、生产实习、毕业实习与毕业设计等。

毕业学分要求: 170。

学制与学位：四年，工学学士。

本专业学生可以辅修的其他专业：机械设计制造及其自动化、计算机科学与技术、电子信息工程。

相近专业：电气工程及其自动化、测控技术与仪器、机械设计制造及其自动化、电子信息工程、电子科学与技术、计算机科学与技术、信息工程、轨道交通信号与控制。

Program for Automation

Specialty and Code: Automation 080801

Education Objectives:

In order to meet the demands of national economic development and social progress, this major takes cultivating students with high morality, sound personality, strong sense of social responsibility, and comprehensive development in scientific, cultural, physical, aesthetic, and labor aspects as its fundamental goal. The aim is to train qualified builders and reliable successors of the socialist cause. The students are systematically trained to master the basic theories, professional knowledge, and basic skills in the field of automation. They can engage in system analysis and design, system and equipment manufacturing and implementation, system testing and operation, scientific research and technological development, management and decision-making in areas such as motion control/process control, intelligent instrumentation and equipment, artificial intelligence and big data technology, robotics technology, computer control systems, and other related fields.

After graduation, students are expected to have the following abilities after about five years:

1. Possess correct values, good humanistic and social accomplishments, scientific and engineering literacy, professional ethics, social responsibility, innovation consciousness and ability, and the aspiration to work hard for the development of the country and the socialist cause.

2. Be able to adapt to the development of modern automation and artificial intelligence technology, integrate engineering and mathematical basic knowledge with automation professional knowledge, and provide systematic solutions for complex engineering problems in areas such as geoscience and geological engineering automation systems, industrial enterprise automation and informatization, intelligent manufacturing and robotics, and equipment design and development.

3. Be able to use modern tools and information technology to engage in the design, research, development, manufacturing, testing, and production of related systems and equipment in this field, with strong engineering practice ability and innovative consciousness, becoming a professional technical talent and business backbone of scientific research institutes and enterprises and institutions.

4. Possess good teamwork skills, organizational management skills, communication and expression skills, international vision, and awareness of environment and sustainable development.

5. Possess a strong physique, awareness, and ability to learn for life, and adapt to development and labor.

Graduation Requirements

The students in this major mainly study basic theories and knowledge in areas such as electronic circuit technology, control theory, detection technology and instruments, process control principles/motion control principles, artificial intelligence and big data, computer software and

hardware, network technology, embedded systems, system optimization, and receive good basic training in engineering practices. They have the basic ability to analyze, design, develop, research, manage, and make decisions in the field of automation.

Graduates are expected to meet the following requirements in terms of knowledge, quality, and ability:

<p>Graduation Requirement 1 Engineering Knowledge: Graduates are required to master mathematics, natural science, engineering foundation and professional knowledge which are necessary for automation engineering, and be able to solve complex automation engineering problems with a comprehensive application of the knowledge.</p>	1-1 : Master the mathematical foundation necessary for engaging in automation engineering, and be able to mathematically deduce, model, and solve complex objects.
	1-2: Master the fundamental knowledge of physics, earth and ecological sciences, engineering graphics, and be able to conduct physical and mechanical analysis and calculation of objects in the field of automation, based on this knowledge.
	1-3 : Master the principles and knowledge related to circuitry, electronics technology, detection technology, and other aspects related to automation engineering design and development, and be able to solve problems related to the deduction, analysis, and design of electronic circuit characteristics involved in complex automation engineering projects.
	1-4 : Master the fundamental knowledge of computer science, networking, and programming languages related to automation engineering design and development, and be able to solve problems related to algorithm design, simulation, software development, and other complex tasks in automation engineering projects.
	1-5 : Master the fundamental professional knowledge of automation control, artificial intelligence, big data, and be able to apply this knowledge and mathematical models to compare and integrate solutions for complex engineering problems in automation.
<p>Graduation Requirement 2 Problem Analysis: Graduates are required to apply the basic principles of mathematics, natural science and engineering science to identify and accurately describe complex engineering problems in the field of automation, and analyze them through literature research to obtain valid conclusions.</p>	2-1 : Be able to apply the fundamental principles of mathematics, physics, and engineering science to identify and judge the key aspects and parameters of complex engineering problems in automation.
	2-2: Be able to correctly use mathematical, physical, and data modeling methods to express complex engineering problems.
	2-3: Be able to use automation expertise to analyze problems and search for multiple solutions to problems through literature research.
	2-4: Be able to realize that there are multiple options to choose from to solve complex automation engineering problems, verify the feasibility of the solutions in practice, and obtain effective conclusions

<p>Graduation Requirement 3 Solution Design/Development: Graduates are required to design solutions for complex engineering problems in the field of automation, design systems, units (components), algorithms, techniques, and devices that meet specific requirements, and demonstrate innovative thinking in the design process, considering social, health, safety, legal, cultural, and environmental factors.</p>	<p>3-1 : Master the fundamental methods and techniques of engineering design and product development, be able to use basic design techniques of automation systems, artificial intelligence, and big data, and understand the factors that affect design.</p>
	<p>3-2 : Be able to complete the design of units (components) and devices for specific requirements of automation systems.</p>
	<p>3-3 : Be able to complete the design and development of control algorithms, application technologies, and implementation for the requirements of automation engineering systems.</p>
	<p>3-4 : Be able to develop and implement automation systems and demonstrate innovative thinking in the design and practical stages.</p>
	<p>3-5 : Be able to analyze the feasibility of design solutions under the constraints of safety, health, legal, cultural, and environmental factors.</p>
<p>Graduation Requirement 4 Research: Graduates are required to conduct research on complex engineering problems in the field of automation based on scientific principles and methods, analyze through literature investigation, including modeling, design, synthesis, experimentation, simulation, optimization, analysis and interpretation of data, and obtain reasonable and effective conclusions through information integration.</p>	<p>4-1 : Be able to analyze and research the physical phenomena, component characteristics, and unit performance of complex engineering problems in the field of automation based on engineering fundamentals and scientific principles through literature review.</p>
	<p>4-2 : Be able to design research routes for key issues in the development or integration of automation control systems based on scientific principles and using scientific methods and professional theories, and carry out analysis, modeling, design, and integration.</p>
	<p>4-3 : Be able to apply professional theories and techniques to design experimental plans for complex automation engineering problems, construct and implement simulation and experimental systems, and collect data correctly.</p>
	<p>4-4 : Analyze and synthesize information from experimental and operational data of automation systems using methods such as artificial intelligence and big data to obtain effective conclusions and scientifically interpret the data.</p>
<p>Graduation Requirement 5 Modern Tool Application: Graduates are required to develop, select and use appropriate technologies, resources, modern engineering tools and information technology</p>	<p>5-1 : Understand the principles and methods of using commonly used modern information technology tools in the field of automation, such as artificial intelligence, big data, modern engineering tools, and simulation software, and understand their applicable scope and limitations.</p>
	<p>5-2 : For complex automation engineering problems, be able to select and use appropriate instruments, information resources, and software simulation tools to conduct analysis, calculation, and design.</p>

<p>tools to solve complex engineering problems in automation, including prediction and simulation of the problems. Meanwhile, they need to have a clear understanding of the limitations of these modern tools.</p>	<p>5-3 : Be able to develop and design experimental systems or tools that meet specific needs, simulate and predict automation engineering problems, and analyze their limitations.</p>
<p>Graduation Requirement 6 Engineering and Society: Graduates are required to conduct reasonable analysis based on engineering-related knowledge, evaluate the impact of automation engineering practices and complex engineering problem solutions on society, health, safety, law, and culture, and understand the corresponding responsibilities to be undertaken.</p>	<p>6-1 : Understand the policies, laws and regulations, engineering ethics, technical standards system, intellectual property, and industrial policies related to automation engineering, and understand the impact of different social cultures on automation engineering activities.</p> <p>6-2 : Be able to recognize the impact of the designed automation scheme on society, health, safety, ethics, law, and culture, as well as the impact of these limiting factors on project implementation, and understand the responsibilities that should be undertaken.</p>
<p>Graduation Requirement 7 Environment and Sustainable Development: Graduates are required to be able to understand and evaluate the impact of automation engineering practices, especially the practices of complex engineering problems, on environmental and social sustainability.</p>	<p>7-1 : Establish a scientific development concept, understand the national environmental protection policies and regulations in the field of automation, and understand the importance, concepts, connotations, and significance of social sustainable development.</p> <p>7-2 : Be able to think from the perspective of environmental protection and sustainable development about the sustainability of automation control engineering practice and evaluate the potential damage and hazards to humans and the environment during the product life cycle.</p>
<p>Graduation Requirement 8 Professional Norm: Graduates are required to have patriotic feelings and the willingness to become a qualified builder and reliable successor of the socialist cause. Have humanistic and</p>	<p>8-1 : Form a correct worldview and outlook on life, understand the relationship between individuals and society, understand the national conditions of China, and have the willingness to become a qualified builder and reliable successor of the socialist cause.</p> <p>8-2 : Have humanistic and social science literacy, understand and consciously abide by engineering professional ethics and norms.</p>

<p>social science literacy and social responsibility, be able to understand and abide by engineering professional ethics and norms in the process of complex system design, operation, and maintenance of automation engineering, and fulfill corresponding responsibilities.</p>	<p>8-3 : Be able to fulfill and assume social responsibilities in the process of complex system design, operation, and maintenance of automation engineering.</p>
<p>Graduation Requirement 9 Individual and Teamwork: Graduates are required to assume the roles of individual, team member and leader in a multidisciplinary team.</p>	<p>9-1 : Understand the composition of the team under a multidisciplinary background and the responsibilities of different role members, and be able to communicate effectively with other members.</p> <p>9-2 : Have a sense of teamwork, be able to listen, coordinate, and integrate member opinions, form reasonable decisions, and be able to independently, cooperatively, and leadership-wise solve problems within the team.</p>
<p>Graduation Requirement 10 Communication: Graduates are required to effectively communicate with industry counterparts and the public on complex automation engineering issues, including writing reports and designing manuscripts, presenting statements, clearly expressing and responding to instructions. They also need to have international vision and can communicate in a cross-cultural context.</p>	<p>10-1 : Be able to accurately express one's own views in oral or written form regarding complex engineering problems in the field of automation, and able to effectively communicate and respond to questions from peers in the industry and the general public in different fields. Able to understand and deal with the differences in communication between peers in the industry and the general public.</p> <p>10-2 : Be able to be aware of and track the development trends of automation discipline both domestically and internationally, possess a certain international perspective, understand and respect the differences and diversity of cultures around the world, and have the ability to communicate and express professionally in language and cross-cultural contexts.</p>
<p>Graduation Requirement 11 Project Management: Graduates are required to understand and master engineering management principles and economic decision-making methods, and</p>	<p>11-1 : Master the management and economic decision-making methods involved in engineering projects, understand the cost structure of the entire life cycle and process of engineering and products, and understand the engineering management and economic decision-making issues involved.</p> <p>11-2 : Be able to apply principles of engineering management and economic decision-making methods in the research, design,</p>

<p>apply them in a multidisciplinary environment.</p>	<p>development, and implementation of complex automation engineering problems in a multidisciplinary environment.</p>
<p>Graduation Requirement 12 Lifelong Learning: Graduates are required to have the consciousness of autonomous and lifelong learning, the ability to learn continuously and adapt to development, and have a strong work ethic and ability</p>	<p>12-1: Have the awareness of self-directed and lifelong learning, as well as the physical health to sustain continuous learning.</p>
	<p>12-2: Be able to adapt to social development, have the ability to learn independently, and be able to actively understand, summarize, and propose questions.</p>
	<p>12-3: Have a good work ethic and work capacity.</p>

The support of Requirements to Training Goals

Graduation requirements of this major	Training Objective 1	Training Objective 2	Training Objective 3	Training Objective 4	Training Objective 5
Graduation Requirements 1		√	√		
Graduation Requirements 2		√	√		
Graduation Requirements 3		√	√		
Graduation Requirements 4		√	√		
Graduation Requirements 5		√	√		
Graduation Requirements 6	√				
Graduation Requirements 7				√	
Graduation Requirements 8	√				
Graduation Requirements 9				√	
Graduation Requirements 10				√	
Graduation Requirements 11			√	√	
Graduation Requirements 12					√

Major Disciplines: Control Science and Engineering

Core Courses: Circuit Theory, Analog Electronic Technology, Digital Electronic Technology, Computer Programming Fundamentals, Automatic Control Theory, Intelligent Sensing and Detection Technology, Principle and Application of Process Control Technology, Motion Control Theory and Application Technology, Embedded System Principle and Application, Computer Network and Industrial Internet, Fundamentals of Artificial Intelligence, Big Data Technology in Intelligent Manufacturing, etc.

Lab Experiments: Circuit and Electronic Technology Experiment, Automatic Control Theory Experiment, Embedded System Technology Experiment, Motion Control Experiment, Process Control Experiment, Sensors Principle and Detection Technology Experiment, Electronic Motor and Power Drive Experiment, Network, and Field Bus, Intelligent Technology Practice, etc.

Practical Work: Practice for Electronic Technology, Practices of Microcontroller Technology,

Practice of Computer Programming, Practice of Control Theory, Practice of Intelligent Earth Exploration Technology and Virtual Instrument, Virtual Simulation Practice of Geological Drilling Process Control, Project Practice of Networked Process Control System, Project Practice of Networked Motion Control System and Trajectory Planning, Practices of Big Data Technology in Intelligent Manufacturing Process, Practice of Intelligent System Technology, Production Practice, Graduation Practice, Graduation Design, etc.

Required Credits for Graduation: 170.

Duration & Degree Granted: Four years, Bachelor of Engineering.

Recommended Minors: Mechanical Design and Automation, Computer Science and Technology, Electronic Information Engineering.

Related Specialties: Electrical Engineering and Automation, Measuring-Controlling Technology and Instruments, Mechanical Design, Manufacture and Automation, Electronic Information Engineering, Electronic Science and Technology, Computer Science and Technology, Information Engineering, Rail Transit Signal and Control.

毕业要求实现矩阵与课程对指标的支撑(Graduation Realization Matrix)

毕业要求 Requirements 教学活动 Teaching Activity	1					2				3					4				5			6		7		8			9		10		11		12							
	1-1	1-2	1-3	1-4	1-5	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	3-5	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2	12-3					
马克思主义基本原理概论 Principles of Marxism																								M		M																
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 the Theoretical System of Socialism with Chinese Characteristics																								M		M																
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																								M		M																
中国近现代史纲要 The Essentials of Modern Chinese History																								L		M																
思想道德修养与法律基础 Moral Education and Fundamentals of Law														M												H																
形势与政策 Situation and Policy														L										M		M																
体育 Physical Education																																							H			
大学英语 College English																											M			M								H				
军事理论 Military theory																								L		M																
劳动教育(含理论和实践) Labor Education/Labor Practice																											M												H		H	
自动化与测控技术导论 Introduction to Automation and Measuring & Control Technology																					M																					
工程制图 Engineering Drawing																																										
高等数学 A Advanced Mathematics A	H					L																																				

毕业要求 Requirements	1					2				3					4				5			6		7		8			9		10		11		12			
	1-1	1-2	1-3	1-4	1-5	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	3-5	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2	12-3	
嵌入式原理及应用 Embedded Principle and Application				M							M					M					M																	
计算机网络与工业互联网 Computer Network and Industrial Internet				M								M							M																			
人工智能基础 The Basis of Artificial Intelligence					M		M			H							L																					
智能制造大数据技术 Big Data Technology in Intelligent Manufacturing					M		M			M																												
过程控制原理与应用技术/ 运动控制理论与应用技术 Principle and Application Technology of Process Control or Motion Control Theory and Application					H																																	
军事训练 Military Training																										M											M	
计算机程序设计实践 Practice of Computer Programming				M									M																									
金工实习 D Metalworking Practice D		M																																		M		M
电子技术综合实践 Practice for Electronic Technology			L								H																											
微控制器技术实习(含企业认知环节) Practices of Embedded System Technology													M																									
控制理论综合实践 Practice of Control Theory													L																									
自动化工程系统综合训练 Comprehensive Practice of Automatic Engineering Systems													L																									M
智能地球探测技术与虚拟仪器实践 Practice of Intelligent Earth Exploration Technology and Virtual Instrument																																						L
地质钻进过程控制虚拟仿真实践																																						L

自动化专业

毕业要求 Requirements	1					2				3					4				5			6		7		8			9		10		11		12			
	1-1	1-2	1-3	1-4	1-5	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	3-5	4-1	4-2	4-3	4-4	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	8-3	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2	12-3	
Virtual Simulation Practice of Geological Drilling Process Control																																						
Practice of Big Data Technology in Intelligent Manufacturing									M			L					H			L																		
网络化过程控制系统项目综合实践 (PBL 式教学) / 网络化运动控制与轨迹规划项目综合实践 (PBL 式教学)									M				H				M										M		M	M				M	M			
Project Practice of Networked Process Control System (PBL)/Project Practice of Networked Motion Control System and Trajectory Planning (PBL)									M				H				M										M		M	M				M	M			
Practice of Intelligent System Technology									M				H				M			M																		
Production Practice														H									H		H			M		H	H		H				H	
Graduation Practice and Graduation Design									H				M				M			M											H			M	H	M		
Social Investigation														M									M	M				L		H			M			H		
Other (Start up, Competition, Invention, Innovation and Research Presentation)																		M												M		M			M	H		

注：L、M、H 表示课程对毕业要求支撑强度分别为低、中、高。

Note: L, M, and H indicate that the support intensity of graduation requirements is low, medium and high, respectively.

自动化专业培养目标及定位 (课程体系)



二选一

自动化专业课程教学计划表

Course Descriptions of Automation

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits								
					课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
					讲课 Lec.	课内实验 Lab	实验/ 科研 实践 Lab/ Res.	研讨 Dis	素质 拓展 Exp										
通识教育课 Liberal Education Courses	12007800	马克思主义基本原理 Principles of Marxism	3	48	48						3								
	12008100	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Tse-tung Thought and the Theoretical System of Socialism with Chinese Characteristics	2	32	32								2						
	12008000	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	48	48								3						
	11711800	中国近现代史纲要 The Essentials of Modern Chinese History	2	32	32							2							
	12007900	思想道德与法治 Ideological morality and rule of law	3	48	48							3							
	12005300	形势与政策 Situation and Policy	2	32	32							每学期平均分配							
	113076*0	体育 Physical Education	4	144	144							1	1	1	1				
	109234*0	大学英语 College English	9	144	144				48			3	3	3					
	14300300	军事理论 Military Theory	2	36	36							2							
	12008200	劳动教育（理论课） Labor Education	1	16	16							1							
	选修 Elective	包括地球科学概论、生态学概论两门必修课程，美育、心理健康教育课程（各不少于2学分）总计12学分，跨学科选修课不低于4学分。	12	12							根据选修课程开课学期分配								
	小计 Sum		43	580	580				48		10	9	4	6					
大英平台课 Platform Courses	22300100	自动化与测控技术导论 Introduction to Automation and Measuring & Control Technology	1	16	16						1								
	20732100	工程制图 Engineer Drawing	2	32	32			2			2								
	212127*1	高等数学 A Advanced Mathematic A	11.5	184	184						5	6.5							

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits							
					课内学时			课外学时			一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
					讲课 Lec.	课内实验 Lab	实验/科研/实践 Lab/Res.	研讨 Dis	素质拓展 Exp									
	21945700	计算机程序设计基础 Computer Programming Fundamentals	2.5	40	40		16			2.5								
	212130*1	大学物理 A College Physics A	8	128	128				高等数学 A	4	4							
	212169*1	物理实验 A Physical Experiment A	2	64	4	60			大学物理 A	1	1							
	21212802	线性代数 B Linear Algebra B	2.5	40	40				高等数学 A			2.5						
	21213501	概率论与数理统计 A Probability Theory and Mathematical Statistics A	3.5	56	56				高等数学 A			3.5						
	21201902	复变函数与积分变换 B Complex Function and the Integral Transformation B	2.5	40	40				高等数学 A			2.5						
	小计 Sum		35.5	600	540	60	18			10.5	11.5	13.5						
学科基础课 Disciplinary Fundamental Courses	22300300	电路理论 Circuit Theory	4.5	72	64	8			高等数学 A	4.5								
	22308100	模拟电子技术 Analog Electronic Technology	3	48	40	8	8	4	电路理论		3							
	22308200	数字电子技术 Digital Electronic Technology	2.5	40	32	8	4	4	电路理论		2.5							
	22313500	离散数学 Discrete Mathematics	1.5	24	24				高等数学 A 线性代数 B				1.5					
	22314110	传感器原理及检测技术 I: 传感器原理及检测技术基础 Intelligent Sensing and Detection Technology	2.5	40	36	4			电路理论、数字电子技术、模拟电子技术			2.5						
	22315210	现代工程师教育 I (工程与社会、环境与可持续发展、职业规范、工程管理基础) Modern Education for Engineers I	2	32	32										2			
	22315220	现代工程师教育 II (企业兼职教师讲授工程管理应用、当代企业先进技术) Modern Education for Engineers II	0.5	8	8											0.5		
	小计 Sum		16.5	264	236	28	12	8			4.5	5.5	2.5	1.5	2	0.5		
专业主干课 Main Specialty Courses	22308510	自动控制原理 Automatic Control Theory	3.5	56	48	8		4	高等数学 A 复变函数与积分变换 B			3.5						
	22308520	线性系统分析与设计 II: Analysis and Design for Linear System	2	32	28	4		4	线性代数 B				2					
	22308610	嵌入式原理及应用 Embedded	2.5	40	32	8	4		数字电子技术、模拟电子技术			2.5						

课程类别 Classification	课程编号 Code	课程名称 Course Name		学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits												
						课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th					
						讲课 Lec.	课内实验 Lab	实验/ 科研 实践 Lab/ Res.	研讨 Dis	素质 拓展 Exp														
	22308620	System Principle and Application	II:嵌入式系统技术 II: Embedded System	1.5	24	16	8	4	4		数字电子技术、模拟电子技术、微机原理与单片机基础					1.5								
	22308700	计算机网络与工业互联网 Computer Networks and Industrial Internet		2	32	28	4	4			数字电子技术、计算机程序设计基础					2								
	22308800	人工智能基础 Fundamentals of Artificial Intelligence		2	32	28	4	4			高等数学 A、离散数学、计算机程序设计基础					2								
	22309000	智能制造大数据技术 Big Data Technology in Intelligent Manufacturing Process		2	32	32					概率统计与随机过程、离散数学、计算机程序设计基础						2							
	22313610	Choose one between the two courses 2选1	过程控制原理与应用技术 I: Process Control Principle and Instrument	3	48	40	8		2		系统建模与经典控制论					3								
	22313620		Process Control Principle and Application II: Networked Process Control System	2	32	28	4			2		系统建模与经典控制论						2						
	22309210		运动控制理论与应用技术 I: Fundamentals of Motor and Motion Control	3	48	40	8			2		系统建模与经典控制论					3							
	22309220		Motion Control Theory and Application II: Digital Servo Control Technique	2	32	28	4			2		系统建模与经典控制论						2						
	小计 Sum				20.5	328	280	48	16	16						6	10.5	4						
专业选修课 Specialty Elective Courses			可按方向设课，具体见专业选修课列表 Courses can be arranged according to the direction, as shown in the list of professional elective courses.		15.5	248	248																	
合计 Sub-total				131	2020	1884	136	46	24	48					20.5	25	23	14.5	12	6	0.5			
实践环节 Practical Work	44300400	军事训练 Military Training		2	2周									2										
	42313300	计算机程序设计实践 Practice of Computer Programming		2	2周						计算机程序设计基础			2										
	40724604	金工实习 D Metalworking Practice D		1	1周						工程制图				1									
	42313400	电子技术综合实践 Practice for Electronic Technology		2	2周						电路理论、数字电子技术、模拟电子技术				2									

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits										
					课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th			
					讲课 Lec.	课内实验 Lab	实验/科研 Lab/Res.	研讨 Dis	素质拓展 Exp												
	42313500	微控制器技术实习(含企业认知环节) Practices of Microcontroller Technology	3	3周						电路理论、数字电子技术、模拟电子技术				3							
	42313600	控制理论综合实践 Practice of Control Theory	1	1周						系统建模与经典控制论、线性系统分析与设计				1							
	42313700	自动化工程系统综合训练 Comprehensive Practice of Automatic Engineering Systems	1.5	1.5周						微机原理与单片机技术、嵌入式系统				1.5							
	42313800	智能地球探测技术与虚拟仪器实践 Practice of Intelligent Earth Exploration Technology and Virtual Instrument	1.5	1.5周						微机原理与单片机技术、嵌入式系统				1.5							
	42314200	地质钻进过程控制虚拟仿真实践 Virtual Simulation Practice of Geological Drilling Process Control	1	1周						系统建模与经典控制论、线性系统分析与设计							1				
	42313900	智能制造大数据技术设计 Practices of Big Data Technology in Intelligent Manufacturing Process	1.5	1.5周						智能制造大数据技术					1.5						
	42314000	Choose According to the Selected Courses 依所选课程选实践	网络过程控制系统项目综合实践(PBL式教学) Project Practice of Networked Process Control System (PBL)	3	3周					过程控制原理与仪表						3					
	42314100		网络化运动控制与轨迹规划项目综合实践(PBL式教学) Project Practice of Networked Motion Control System and Trajectory Planning (PBL)	3	3周						电机与运动控制基础、微机原理与单片机技术、嵌入式系统						3				
	42312800	智能系统技术实践 Practice of Intelligent System Technology	1.5	1.5周						人工智能基础、计算机程序设计基础				1.5							
	42302500	生产实习 Production Training	2	2周														2			
	42008300	劳动教育(实践课) Labor Practice	1	1周												1					
	42314700	毕业实习与毕业设计 Graduate Practice and Graduation Design	10	16周														10			
	小计 Sum		34	40周										2	2	3	3	5.5	5.5	3	10
创新创业自主学习 Freedom study	ZZ35000S	社会调查 Social Investigation	2													2					
		其他(创业基础、学科竞赛、发明创造、科研报告) Others (Start-up, Contest, Invention, Innovation and Research Presentation)	3																		
	小计 Sum		5																		

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits							
					课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
					讲课 Lec.	课内实验 Lab	实验/ 科研 实践 Lab/ Res.	研讨 Dis	素质 拓展 Exp									
总计 Total			170	2020 +40周	1884	136	46	24	48		22.5	27	26	17.5	17.5	11.5	3.5	10
可开出专业选修课列表 Specialty Elective Courses	22309700	控制理论与方法	运筹学与系统工程 Operations Research and System Engineering	2	32	28	4			系统建模与经典控制论、线性系统分析与设计								2
	22309900		智能控制 Intelligent Control	1.5	24	20	4			系统建模与经典控制论、线性系统分析与设计							1.5	
	22313700		动态系统建模* Dynamic Systems Modeling	1.5	24	24				系统建模与经典控制论、线性系统分析与设计					1.5			
	22310000		最优控制 Optimal Control	1.5	24	24				系统建模与经典控制论、线性系统分析与设计							1.5	
	22310100	嵌入式系统技术	大规模可编程器件 Large Scale Programmable Devices	1.5	24	12	12	8		微机原理与单片机技术、嵌入式系统								1.5
	22310200		DSP原理及应用 Principle and Application of DSP	1.5	24	16	8	8		微机原理与单片机技术、嵌入式系统							1.5	
	22310300	过程控制技术 (过控方向学生至少选两门)	过程建模与系统辨识 Process Modeling and System Identification	2	32	24	8			系统建模与经典控制论、过程控制原理与仪表					2			
	22310400		工业智能制造技术 Industrial Intelligent Manufacturing Technology	1.5	24	20	4			过程控制原理与仪表、网络化过程控制系统							1.5	
	22307300		工业过程智能优化技术 Intelligent Optimization Technology for Industrial Process	2	32	28	4			过程控制原理与仪表						2		
	22310500	运动控制技术 (运控方向学生至少选两门)	电力电子技术 Power Electronics Technology	2	32	28	4	4		系统建模与经典控制论					2			
	22307100		机器人控制系统 Robot Control System	2	32	28	4			智能传感与检测技术、系统建模与经典控制论、线性系统分析与设计、电机与运动控制基础、数字伺服控制技术						2		
	22310600		先进运动控制系统 Advanced Motion Control System	1.5	24	20	4			系统建模与经典控制论、线性系统分析与设计、电机与运动控制基础、数字伺服控制技术							1.5	

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite Courses	学期学分分配 Semester Credits							
					课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
					讲课 Lec.	课内实验 Lab	实验/ 科研 实践 Lab/ Res.	研讨 Dis	素质 拓展 Exp									
	22314200	智能地学虚拟仪器 Intelligent Geoscience Virtual Instruments	1.5	24	12	12											1.5	
	21932103	数据库原理 C Database System	2	32	24	8			计算机程序设计基础								2	
	22313900	数字信号处理 Digital Signal Processing	2	32	28	4	4		复变函数与积分变换 B							2		
	22310800	数字图像处理 Digital Image Processing	2	32	24	8			数字信号处理								2	
	22310900	物联网技术* Internet of Things Technology	1.5	24	16	8			智能传感与检测技术								1.5	
	22311000	模式识别与机器学习 Pattern Recognition and Machine Learning	2	32	28	4			人工智能基础、离散数学								2	
	22307200	智能机器人技术 Intelligent Robot Technology	2	32	28	4			人工智能基础、离散数学							2		
	22313800	机器人建模与控制 Robot Modeling and Control	2	32	28	4			人工智能基础、离散数学							2		
	22311100	智能电网技术 Smart Power Grid Technology	1.5	24	22	2			电路理论、电机与运动控制基础、数字伺服控制技术								1.5	
	22315200	创新创业工程实践（智能车方向，机器人方向，自主选题方向） Innovative Engineering Practice	1	16	4	12	16						1					
	22313300	“走进自动化”创新实践 Innovation Practice of Entering the Automation	1	16	16		8	8	8			1						

注：全英课程须在课程名称后打*标出，通识教育选修课学分未列入具体学期，学院须根据学校创新创业自主学习学分认定一览表制订实施细则。

Note: All English courses should be marked * after the title of the course, general education elective course credits are not included in the specific semester, and colleges should formulate implementation rules according to the list of credits for independent learning of school innovation and entrepreneurship.

自动化专业课程分类统计

	通识教育课程 Liberal Education Courses		大类平台课 +学科基础课 Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	专业选修课 Specialty Elective Courses	实践环节 Practical Work	创新创业自主学习 Autonomous Learning	学时总计 Total Hours	学分总计 Total Credits
	必修 Compulsory	选修 Elective							
学时/学分 Hours/Credits	580/31	192/12	864/52	328/20.5	248/15.5	40周/34	5	2020 +40周	170
学分所占比例 Ratio of Credits	25.30%		30.59%	12.06%	9.12%	20.00%	2.94%	100%	100%

注：实践环节占比计算未包含创新创业学