

**Specialty and Code:** Automation 080801

**Education Objectives:**

This program aims at cultivating students who are equipped with noble moral character, high sense of social responsibility and good scientific and cultural literacy to meet the needs of national economy development. Graduates will be trained to be broad-caliber, research-oriented and application-oriented talents who are qualified for engaging in system analysis, system design, system operation, scientific research, technology development, management, and decision-making in the fields of motion control/process control, intelligent geoscience instruments and equipment, artificial intelligence and data technology, robot technology, computer control system, etc.

After 5 years of work or study since graduation, students are expected to possess the following abilities:

1. Occupation and Professional Literacy: They will be equipped with humanities and social science literacy, professional ethics, social responsibility and innovation awareness, and abide by laws and regulations;

2. Application of Professional Knowledge in Engineering: They will adapt to the development of modern automation technology, integrate the basic knowledge of engineering mathematics with automation expertise, and provide systematic solutions to complex automation engineering problems;

3. Design and Development Abilities: They will have the abilities of tracking cutting-edge technologies in automation and related fields, the abilities of engineering innovation and scientific research, to design, develop and manufacture automation products with the application of modern tools, or to conduct relevant theoretical research and serve the society with will and competence;

4. Communication and Management Abilities: They will have the abilities of cooperation, organization and management, communication and international vision to engage in technical and management work in automation;

5. Learning and Development Abilities: They will be competent for their job responsibilities, and have the ability to learn for life and to adapt to development.

**Graduation Requirements**

Students are required to master the basic knowledge of control theory, detection technology and instrumentation, process control principles/motion control principles, artificial intelligence and big data, computer hardware and software, network technology, microcomputer principle, embedded system, system optimization, etc. They will receive strict training in basic engineering practice and possess basic capabilities for system analysis, design, development, research, management and decision-making in the field of automation.

Graduates should meet the following requirements in terms of knowledge, quality, and ability:

<b>Graduation Requirement 1</b> <b>Engineering Knowledge:</b> Graduates are required to	1-1: Be Proficient in applying mathematics and natural science knowledge for problem presentation.
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<p>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>	<p>1-2: Be able to establish mathematical models of automation system working process, use engineering foundation and professional knowledge to deduct and analyze automation engineering problems.</p>
	<p>1-3: Be able to use relevant knowledge and mathematical models to compare and synthesize solutions to complex automation engineering problems.</p>
<p><b>Graduation Requirement 2</b>  <b>Problem Analysis:</b> 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>	<p>2-1: Be able to apply scientific principles to identify key aspects of complex automation engineering problems and present them by way of mathematical model.</p>
	<p>2-2: Be able to analyze complex automation engineering problems through literature research and seek various solutions to the problems.</p>
	<p>2-3: Be able to analyze influencing factors and obtain effective engineering problem solutions by applying automation expertise and principles.</p>
<p><b>Graduation Requirement 3</b>  <b>Solution Design/Development:</b> Graduates are required to design solutions to complex automation engineering problems, design systems, units (components), technological process or devices that meet specific needs. They also need to embody innovation awareness in the design process and take social, health, safety, legal, cultural and environmental factors into account.</p>	<p>3-1: Be able to use the basic design techniques of automation system and understand the influencing factors in design.</p>
	<p>3-2: Be able to complete the design of controlling system or controlling unit according to the specific needs of automation system.</p>
	<p>3-3: Be able to complete the design of automation system and embody innovation awareness in design and practice.</p>
	<p>3-4: Be able to analyze design feasibility under the constraints of safety, health, legal, cultural and environmental factors.</p>
<p><b>Graduation Requirement 4</b>  <b>Research:</b> Graduates are required to study complex automation engineering problems by using scientific methods of modeling, simulation, optimization, data analysis and interpretation on the basis of scientific principles, and obtain reasonable and effective conclusions through information synthesis.</p>	<p>4-1: Be able to analyze solutions to complex automation engineering problems on the basis of engineering fundamentals and scientific principles.</p>
	<p>4-2: Be able to apply professional theories and techniques, select research routes, design, build and implement professional experiments in automation.</p>
	<p>4-3: Be able to solve automation engineering problems through information analysis and synthesis, and explain the data scientifically.</p>

<p><b>Graduation Requirement 5</b></p> <p><b>Modern Tool Application:</b> Graduates are required to develop, select and use appropriate technologies, resources, modern engineering tools and information technology 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>5-1: Be able to understand the principles and methods of using modern instruments, information technology tools, engineering tools and simulation software commonly used in automation, and understand the scope and limitations of their application.</p> <p>5-2: Be able to select appropriate simulation software for the analysis, calculation and design of complex automation engineering problems.</p> <p>5-3: Be able to design experimental system, simulate and predict automation engineering problems, and analyze their limitations.</p>
<p><b>Graduation Requirement 6</b></p> <p><b>Engineering and Society:</b> 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: Be able to understand the principles, guidelines, laws and regulations in the field of automation engineering, and understand the impact of social culture on engineering activities.</p> <p>6-2: Be able to recognize the impact of the design on society, health, safety, law and culture, and understand the corresponding responsibilities.</p>
<p><b>Graduation Requirement 7</b></p> <p><b>Environment and Sustainable Development:</b> 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 outlook on development, understand relevant national environmental protection policies and regulations, as well as the importance, connotation and significance of sustainable social development.</p> <p>7-2: Be able to evaluate the impact of automation engineering practices on environmental protection and sustainable social development.</p>
<p><b>Graduation Requirement 8</b></p> <p><b>Professional Norm:</b> Graduates are required to be equipped with patriotism, humanities and social science literacy and a sense of social responsibility, be able to understand and abide by engineering professional ethics and norms in the process of design, operation, and maintenance of complex systems, so as to fulfill corresponding responsibilities;</p>	<p>8-1: Establish correct outlooks on world and life, understand the relationship between individual and society, understand China's national conditions.</p> <p>8-2: Be equipped with humanities and social science literacy, engineering professional ethics and norms, and a sense of social responsibility.</p>

<p><b>Graduation Requirement 9</b>  <b>Individual and Teamwork:</b> Graduates are required to assume the roles of individual, team member and leader in a multidisciplinary team.</p>	<p>9-1: Be able to understand the composition of the team in a multidisciplinary context and different responsibilities of different roles, and effectively communicate with other members.</p> <p>9-2: Be equipped with a sense of teamwork, have the ability to listen, to coordinate, to integrate members' opinions and form reasonable decisions.</p>
<p><b>Graduation Requirement 10</b>  <b>Communication:</b> 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 express opinions clearly in words or in writing on automation engineering problems, conduct effective communications with industry peers and the public in different fields.</p> <p>10-2: Be able to understand and track the development trend of automation at home and abroad, and have the language competence to conduct professional communication in a cross-cultural context.</p>
<p><b>Graduation Requirement 11</b>  <b>Project Management:</b> Graduates are required to understand and master engineering management principles and economic decision-making methods, and apply them in a multidisciplinary environment.</p>	<p>11-1: Understand the process of implementing automation engineering projects, understand and apply engineering management methods.</p> <p>11-2: Understand the cost structure of an automation project, and consider and integrate economic factors into the project design process.</p>
<p><b>Graduation Requirement 12</b>  <b>Lifelong Learning:</b> Graduates are required to have the consciousness of autonomous and lifelong learning, and the ability to learn continuously and adapt to development.</p>	<p>12-1: Have the consciousness of autonomous and lifelong learning, and a healthy body for continuous learning.</p> <p>12-2: Be able to adapt to social development, to learn independently, to actively understand, summarize and ask questions.</p>

**The support of Requirements to Training Goals**

Graduation requirements of this major	Training Objective1	Training Objective2	Training Objective3	Training Objective4	Training Objective5
Graduation Requirements1-1		√	√		
Graduation Requirements1-2		√	√		
Graduation Requirements1-3		√	√		
Graduation Requirements2-1		√	√		
Graduation Requirements2-2		√	√		
Graduation Requirements2-3		√	√		
Graduation Requirements3-1		√	√		
Graduation Requirements3-2		√	√		
Graduation Requirements3-3	√	√	√		
Graduation Requirements3-4	√	√	√		
Graduation Requirements4-1		√	√		
Graduation Requirements4-2		√	√		
Graduation Requirements4-3		√	√		
Graduation Requirements5-1		√	√		
Graduation Requirements5-2		√	√		
Graduation Requirements5-3		√	√		
Graduation Requirements6-1	√			√	
Graduation Requirements6-2	√			√	
Graduation Requirements7-1	√				√
Graduation Requirements7-2	√				√
Graduation	√			√	√

Requirements8-1					
Graduation Requirements8-2	√			√	√
Graduation Requirements9-1				√	√
Graduation Requirements9-2				√	√
Graduation Requirements10-1				√	
Graduation Requirements10-2				√	
Graduation Requirements11-1				√	
Graduation Requirements11-2	√			√	
Graduation Requirements12-1					√
Graduation Requirements12-2					√

**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, Single-chip Microcomputer 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:** Metalworking Practice, Course Design for Electronic Technology, Integrated Circuit Practice, Course Design for Computer Programming, Course Design for Control Theory, Practices of Embedded System Technology, Design of Intelligent Geoscience Virtual Instrument, Practices in Process Control, Practices in Motion Control, Practice of Big Data Technology in Intelligent Manufacturing, Practice of Intelligent System Technology, Production Practice, Graduation Practice, Graduation Design, etc.

**Required Credits for Graduation:** 172.

**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(Graduation Realization Matrix)

Requirements	1			2			3				4			5			6		7		8		9		10		11		12		
	1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	3-4	4-1	4-2	4-3	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2	
Teaching Activities																															
Principles of Marxism									H												H	M							L	L	
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics									H								M	L			H	L							L	L	
The Essentials of Modern Chinese History									M								L	L			M	L									
Moral Education and Fundamentals of Law									H							H	H				H	H		L							
Situation and Policy									M								M	H	L		H	M									
Physical Education																							M	M					H		
College English					M																				H	H				L	
Military theory																					M	M	M	M							
Introduction to Earth Sciences																	L	M		M											
Introduction to Ecology									L								M	H	M	H											
Introduction to Automation and Measuring & Control Technology							M	L	L	L										M	M								L	L	
Engineering Drawing		L						L			M			H																	
Advanced Mathematics A1	H	H	M	H							M																				
Advanced Mathematics A2	H	H	M	H							M																				
Computer Programming Fundamentals							M	M	M					H	H	H															



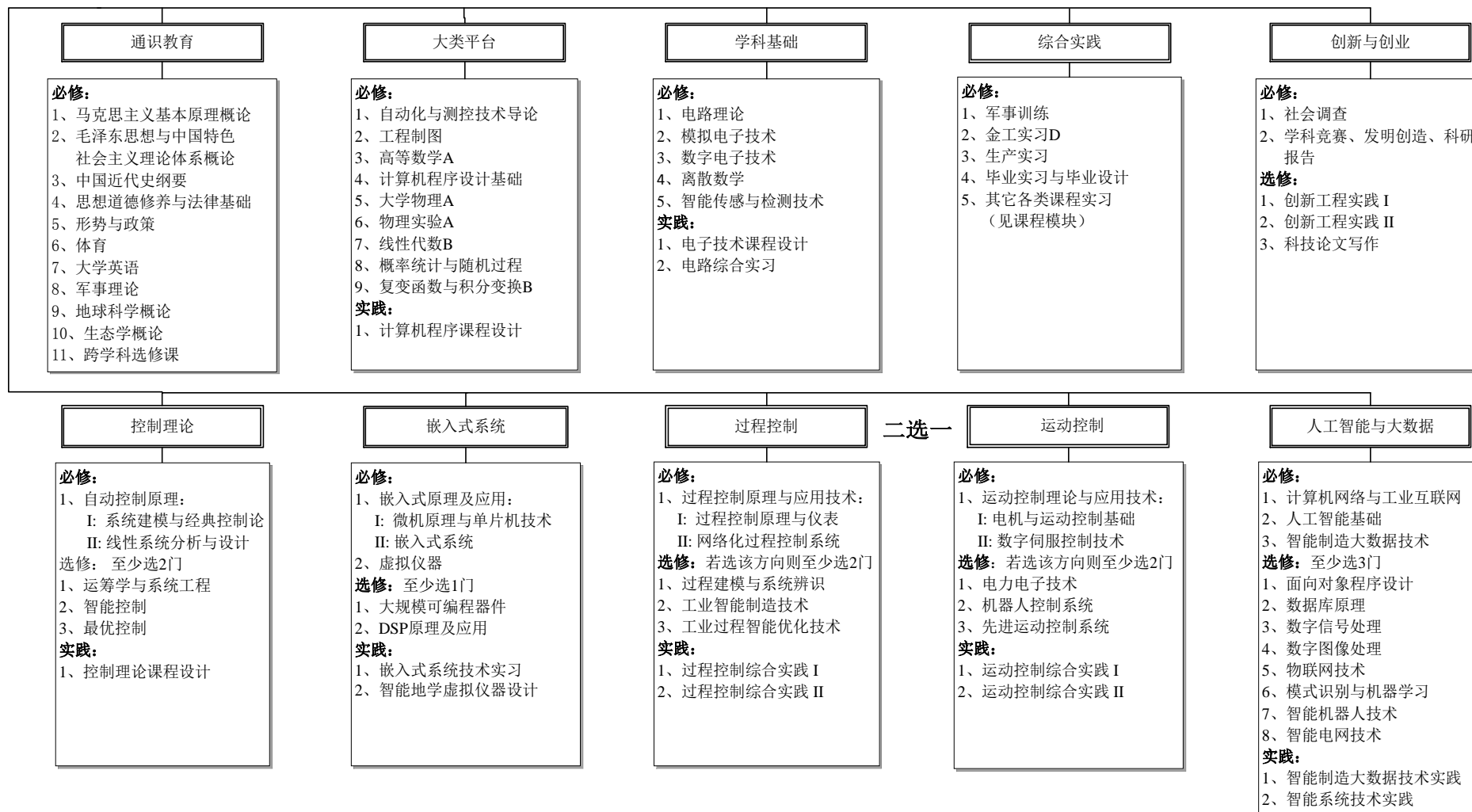
Requirements	1			2			3				4			5			6		7		8		9		10		11		12	
	1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	3-4	4-1	4-2	4-3	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2
Teaching Activities																														
College Physics A	H	H	L	L																										
Physical Experiment A			M								L			L	L															
Linear Algebra B	H	H	M	H							M																			
Probabilistic Statistics and Stochastic Processes	H	H	M	H							M		L																	
Complex Variable Function and Integral Transform B	H	H	M	H							M																			
Circuit theory		M				M	L	H	L			L		M																
Analog Electronics Technology		M				M	L	H	L			L		M		L														
Digital Electronic Technology		M				M	L	H	L			L		M		L														
Discrete Mathematics	H	H	M	H							M																			
Intelligent Sensing and Detection Technology						M	H	H	H		H	H	H	M																
Principle of Automatic Control I			M	M		H	H	H	H		H	H	H																	
Principle of Automatic Control II			M	M		H	H	H	H		H	H	H																	
Embedded Principle and Application I						M	M	H	H		M	M		M		M														
Embedded Principle and Application II						M	M	H	H		M	M		M		M														
Computer Network and Industrial Internet						M	M	H	H		M	M		M		M														
The Basis of Artificial Intelligence			M			M	H	H	H		H	H	H		M															

Requirements	1			2			3				4			5			6		7		8		9		10		11		12								
	1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	3-4	4-1	4-2	4-3	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2							
Teaching Activities																																					
Virtual Instrument								H	H		M	M	M	H	H	M																					
Big Data Technology in Intelligent Manufacturing								L	M		M	M	H	H	H	H																					
Principle and Application Technology of Process Control I				M		H	H	H	H		H	H	H		M	M																					
Principle and Application Technology of Process Control II				M		H	H	H	H		H	H	H		M	M																					
Motion Control Theory and Application I				M		H	H	H	H		H	H	H		M	M																					
Motion Control Theory and Application II				M		H	H	H	H		H	H	H		M	M																					
Military Training																					H	L	L	H											M		
Course Design for Computer Programming								M			L	L		H	H	H																					
Metalworking Practice D														M	L	L								M	M												
Course Design for Electronic Technology			M			M	M	M	M			M		M	M																				M		
Integrated Circuit Practice			M			M	H	H	H					M		M																				L	
Course Design of Control Theory			M	M		M	H	H	H		M	M																								L	
Practice of Embedded System Technology					M		H	H	H		M	M		M		M																				M	M
Design of Intelligent Geoscience Virtual Instrument					M		H				M	M	M	M	H	M								M	M	M									M	M	
Practice of Big Data Technology in Intelligent Manufacturing							H		H		M	M	H	M	M	M																			L	M	
Comprehensive Practice of Process Control I			M		M	M	H	H	H		M	M	M											M	M	L								M	M		

Requirements	1			2			3				4			5			6		7		8		9		10		11		12		
	1-1	1-2	1-3	2-1	2-2	2-3	3-1	3-2	3-3	3-4	4-1	4-2	4-3	5-1	5-2	5-3	6-1	6-2	7-1	7-2	8-1	8-2	9-1	9-2	10-1	10-2	11-1	11-2	12-1	12-2	
Teaching Activities																															
Comprehensive Practice of Process Control II			M		M	M	H	H	H		M	M	M										M	M	L		M	M			
Comprehensive Practice of Motion Control I			M		M	M	H	H	H		M	M	M										M	M	L		M	M			
Comprehensive Practice of Motion Control II			M		M	M	H	H	H		M	M	M										M	M	L		M	M			
Practice of Intelligent System Technology					M		H	H	H		M	M		M	M										L						
Production Practice		M	L			L	M	H	L	L	M	M	H	L	L	M	H	H		L		H	H	H	H	H	M	L			
Graduation Practice and Graduation Design	M	M	H	H	H	H	H	H	H	M	H	H	H	H	H	H	L	L	L	L	L	L	L	L	M	M	H	H	H	H	
Social Investigation					H	H	L			M	M		H				M	M	M	M	L	L	M	M	H	H	L	L		H	
Other (Start up, Competition, Invention, Innovation and Research Presentation)			L	H	H	H	H	H	H	M	H	H	H	H	H	H								H	H	M	M	M	M	M	H

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）



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				1st	2nd	3rd	4th	5th	6th	7th	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										
必修 Compulsory	11706200	马克思主义基本原理概论 Principles of Marxism	3	48	48							3							
	11706500	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	4	64	64									4					
	11711800	中国近现代史纲要 The Essentials of Modern Chinese History	2	32	32											2			
	12005200	思想道德修养与法律基础 Morality Education and Fundamentals 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								
	70100300	地球科学概论 Introduction to Earth Sciences	1.5	24	24			8				1.5							
	70400600	生态学概论 Introduction to Ecology	1.5	24	24						1.5								
选修 Elective	包括地球科学概论、生态学概论两门必修课程总计12学分，含创新创业选修课学分，跨学科选修课不低于4学分 There are 12 credits in the two compulsory courses, including Introduction to Geosciences and Ecology, including Innovation and Entrepreneurship elective course credits, and no less than 4 credits in the interdisciplinary elective course.		9	144	144						根据选修课程开课学期分配								
	小计 Sum		41	740	740			8	48		10.5	5.5	7	5		2			
大类专业平台课 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 A1	11.5	184	184						5	6.5							
	21975700	计算机程序设计基础 Computer Programming Fundamentals	2.5	40	40			16				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									
	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					
	21202400	概率统计与随机过程 Probabilistic Statistics and Stochastic Processes	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					
	<b>小计 Sum</b>		<b>35.5</b>	<b>600</b>	<b>540</b>	<b>60</b>	<b>18</b>				<b>8</b>	<b>14</b>	<b>13.5</b>					
Disciplinary Fundamental Courses 学科基础课	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					
	22308300	离散数学 Discrete Mathematics	2	32	32					高等数学 A 线性代数 B				2				
	22308400	智能传感与检测技术 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				
	<b>小计 Sum</b>		<b>14.5</b>	<b>232</b>	<b>204</b>	<b>28</b>	<b>12</b>	<b>8</b>				<b>4.5</b>	<b>5.5</b>	<b>4.5</b>				
	Main Specialty Courses 专业主干课	22308510	自动控制原理 Automatic Control Theory	I: 系统建模与经典控制论 I: Modeling and Classical 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		II: 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 System Principle and Application	I: 微机原理与单片机技术 I: Principle of Micro-computer and Technology of Microcontroller	2.5	40	32	8	4		数字电子技术、模拟电子技术				2.5				
22308620		II: 嵌入式系统 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			

课程类别 Classification	课程编号 Code	课程名称 Course Name		学分 Crts	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	
	22308900	虚拟仪器 Virtual Instrument		1.5	24	16	8	8		微机原理与单片机技术、计算机程序设计基础					1.5					
	22309000	智能制造大数据技术 Big Data Technology in Intelligent Manufacturing		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				
	22309110	Choose one between the two courses 2选1	过程控制原理与应用技术 I:过程控制原理与仪表 I: Process Control Principle and Instrument	3	48	40	8		2	系统建模与经典控制论					3					
	22309120		Process Control Principle and Application II:网络化过程控制系统 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:电机与运动控制基础 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:数字伺服控制技术 II: Digital Servo Control Technique	2	32	28	4		2	系统建模与经典控制论						2				
	小计 Sum				22	352	296	56	24	16					6	12	4			
Elective Courses 专业选修课			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.		16	256	256													
合计 Sub-total				129	2180	2036	144	62	24	48		18.5	24	26	15.5	12	6			
Practical Work 实践环节	44300400	军事训练 Military Training		2	2周							2								
	41945800	计算机程序课程设计 Course Design for Computer Programming		1.5	1.5周					计算机程序设计基础		1.5								
	40724604	金工实习 D Metalworking Practice D		1	1周					工程制图			1							
	42302800	电子技术课程设计 Course Design for Electronic Technology		2	2周					电路理论、数字电子技术、模拟电子技术			2							
	42307500	电路综合实习 Integrated Circuit Practice		2	2周					电路理论、数字电子技术、模拟电子技术				2						
	42302100	控制理论课程设计 Course Design for 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				

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													
	42307600	嵌入式系统技术实习 Practices of Embedded System Technology		2	2周						微机原理与单片机技术、嵌入式系统					2							
	42309300	智能地学虚拟仪器设计 Design of Intelligent Geoscience Virtual Instruments		1.5	1.5周						虚拟仪器					1.5							
	42309400	智能制造大数据技术实践 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						
	42309510	Choose According to the Selected Courses 依所选课程选实践	过程控制综合实践 I: PLC-DCS 综合设计 I: PLC-DCS Comprehensive Design	2	2周						过程控制原理与仪表					2							
	42309520		网络过程监控系统设计 II: Design of Networked Process Monitoring System	2	2周						网络化过程控制系统						2						
	42309610		基于嵌入式系统的运动控制器设计 I: Design of Motion Controller Based on Embedded System	2	2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						2						
	42309620		三维运动轨迹规划与控制系统设计 II: Design of 3D Trajectory Planning and Control System	2	2周						数字伺服控制技术、微机原理与单片机技术、嵌入式系统						2						
	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						
	42302600	毕业实习与毕业设计 Graduate Practice and Graduation Design		16	16周														16				
	小计 Sum			38	38周											2	1.5	3	2	6.5	5.5	1.5	16
创新创业自主学习 Freedom study	ZZ35000S	社会调查 Social Investigation		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																			
总计 Total				172	2180+38周	2036	144	62	24	48						20.5	25.5	29	17.5	18.5	11.5	1.5	16
列表 Specialty	22309700	控制理论 (不少于2门)	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			



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				1st	2nd	3rd	4th	5th	6th	7th	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									
	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		
	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	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	嵌入式系统 (不少于1门) 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	过程控制 (选该方向的学生不少于2门) 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	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	运动控制 (选该方向的学生不少于2门) 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	
	22310700	面向对象程序设计 Object-Oriented Programming	2	32	16	16	16			计算机程序设计基础				2				
	21932103	人工智能与大数据 (不少于3门) 数据库原理 Database System	2	32	24	8				计算机程序设计基础					2			
	22306800	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	

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									
	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
	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
	22311410	创新创业选修课 (不多于1门) 创新工程实践 I (智能车方向) Innovative Engineering Practice I	1	16	4	12	16							1				
	22311420	创新工程实践 II (机器人方向) Innovative Engineering Practice II	1	16	4	12	16							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	548/29	192/12	832/50	352/22	256/16	38周/38	5	2180+38周	172
学分所占比例 Ratio of Credits	23.8%		29.1%	12.8%	9.3%	22.1%	2.9%	100%	100%

注：实践环节占比计算未包含创新创业学分、选修课实验、课外实验学时。

## Course Descriptions of Automation (Minor)

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									
Fundamental Courses 学科基础课	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						
	小计 Sum		5.5	88	72	16	12	8			5.5							
Main Specialty Courses 专业主干课	22308510	自动控制原理 I: 系统建模与经典控制论 Automatic Control Theory I: Modeling and Classical 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					
	22308610	嵌入式原理及应用 Embedded System	2.5	40	32	8	4		数字电子技术、模拟电子技术				2.5					
	22308620	Principle and Application	1.5	24	16	8	4	4	数字电子技术、模拟电子技术					1.5				
	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		
	22309110	过程控制原理与应用技术 Process Control Principle and Application	3	48	40	8		2	系统建模与经典控制论					3				
	22309120	II: 网络化过程控制系统 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 I: 电机与运动控制基础 I: Fundamentals of Motor and Motion Control	3	48	40	8		2	系统建模与经典控制论					3				
	22309220	II: 数字伺服控制技术 II: Digital Servo Control Technique	2	32	28	4		2	系统建模与经典控制论							2		
	小计 Sum		14.5	232	196	36	8	16					6	4.5	4			
	Practical Work 实践环节	42307600	嵌入式系统技术实习 Practices of Embedded System Technology	2	2周					嵌入式原理及应用						2		
42309400		智能制造大数据技术实践 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		
小计 Sum			3.5	3.5周											2	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										
总计 Total			23.5	320+ 3.5 周	268	52	20	24						5.5	6	6.5	5.5		

Course classification and credits

课程类别 统计	学科基础课 Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	实践环节 Practical Work	学时总计 Total Hours	学分总计 Total Credits
学时/学分	5.5	14.5	3.5	320+3.5 周	23.5
学分所占比例	23.4%	61.7%	14.9%	100%	100%