

测控技术与仪器专业人才培养方案

Undergraduate Program for Measurement-Control Technology and Instrument Major

学科门类：工学	国标代码：08	
Discipline Type: Engineering	Code: 08	
专业类：仪器类	国标代码：0803	
Type: Instrument	Code: 0803	
专业名称：测控技术与仪器	国标代码：080301	校内代码：16
Title of the Major: Measurement-Control Technology and Instrument	Code: 080301	

一、学制与学位 Length of Schooling and Degree

学制：四年 Duration: Four years

授予学位：工学学士 Degree: Bachelor of Engineering

二、培养目标 Educational Objectives

适应社会经济发展和能源电力相关行业技术进步需求，以培养社会主义建设者和接班人为根本任务，培养系统掌握测量、控制和计算机应用的基本理论及技术，电力特色鲜明，能够在能源、环保及流程工业等领域从事与仪器仪表及过程控制相关的研究、设计、制造、计量测试及项目管理等工作，德智体美劳全面发展的卓越工程科技人才。

This major is set to adapt the needs of socio-economic development and technological progress in energy and power related industries and the fundamental task is training socialist builders and successors. The graduates have distinctive electric power characteristics are aimed to be cultivated to be excellent engineering and technological talents, who systematically master the basic theory and technology of measurement, control and computer application, can engage in research, design, manufacturing, metrology and measurement and project management related to process control and instrumentation in the fields of energy, environmental protection and process industry. They are also required to have the comprehensive development of moral, physical and mental skills.

学生毕业 5 年左右能够达到的职业和专业成就：

(1) 具备良好的理工基础与人文素养，具有健全的人格和正确的价值观，能够正确认识工程实践对环境、社会可持续发展的影响；

(2) 能够系统运用测控技术与仪器仪表，综合考虑社会、健康、安全、法律、文化以及环境等因素，针对能源电力相关行业测量与控制领域复杂工程问题，设计开发相应的解决方案；

(3) 具有良好的团队合作精神和项目管理能力，遵守法律法规，具有工程职业道德，遵守职业规范，有社会责任感；

(4) 能够跟踪测控技术及仪器仪表领域的前沿技术和能源电力相关行业国内外发展趋

势，具备良好的主动发展意识、创新精神与自主终身学习能力；

(5) 具备良好的表达与沟通能力，能够承担国际交流与对外合作工作。

Graduates are expected to have the following professional achievements after 5 years of work practice:

(1) They will have a good scientific and technological foundation and humanistic literacy, and have a sound personality and correct values;

(2) They can systematically apply measurement and control theory and technology to provide solutions to complex engineering problems in the measurement and automation field of energy and power related industries, and has the ability to undertake measurement and automation engineering projects;

(3) They will have a good teamwork spirit and management coordination ability, have a sense of social responsibility and engineering ethics, and abide by professional standards;

(4) They are able to track cutting-edge technologies in the field of measurement & automation and development trends at home and abroad in energy and power-related industries, and have a good sense of active development, innovative spirit and independent lifelong learning ability;

(5) They will have good expression and communication skills, and be able to undertake international exchanges and foreign cooperation.

三、专业培养基本要求 Skills Profile

本专业学生毕业时应达到以下要求：

(1) 工程知识：掌握数学、自然科学、工程基础和专业基础知识，能够用于解决能源电力相关行业测控技术与仪器领域的复杂工程问题。

(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，识别、表达并通过文献研究分析能源电力相关行业测控技术与仪器领域的复杂工程问题，能够给出合理的解决方案。

(3) 设计/开发解决方案：能够设计针对能源电力相关行业测控技术与仪器领域复杂工程问题的解决方案，设计满足生产需求的测控系统或仪器仪表，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。

(4) 研究：能够基于科学原理并采用科学方法对测控技术与仪器领域，尤其是能源电力相关行业测控技术与仪器领域复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

(5) 使用现代工具：能够针对能源电力相关行业测控技术与仪器领域的复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。

(6) 工程与社会：能够基于能源电力相关行业的工程背景知识进行合理分析，评价测控技术与仪器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，并理解应承担的责任。

(7) 环境和可持续发展：能够理解和评价针对能源电力相关行业测控技术与仪器领域复杂工程问题的工程实践对环境、社会可持续发展的影响。

(8) 职业规范：具有人文社会科学素养、社会责任感，能够在能源电力相关行业测控技术与仪器领域的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。

(10) 沟通：能够就能源电力相关行业测控技术与仪器领域的复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

(11) 项目管理：理解并掌握测控技术与仪器领域的工程管理原理与经济决策方法，并能在多学科环境中应用。

(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。

The graduates should meet the following requirements:

(1) Engineering knowledge: they should possess mathematics, natural science, engineering foundation and professional knowledge to analyze and solve the complicated engineering problems in measurement-control technology and instrument field of energy and power related industries.

(2) Problem analysis: they should have the ability to identify, express and analyze complicated engineering problems in measurement-control technology and instrument field of energy and power related industries through literature research by using the basic principles of mathematics, natural science, and engineering science, and design solutions.

(3) Solutions design/development: they should have the ability to design the solution for measurement-control system and instrument in the complex engineering problems in measurement-control technology and instrument field of energy and power related industries systematically, and have the ability to design the technological process and system for some purpose, taking multi-factors, such as innovativeness in the design phase, society, healthy, safety, law, culture, and environment in account.

(4) Research: they should have the ability to conduct investigations of complex measurement and control engineering problems in measurement-control technology and instrument field of energy and power related industries using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

(5) Modern tool usage: they should be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for complex engineering problems in measurement-control technology and instrument field of energy and power related industries, including the prediction and simulation of complex engineering problems, and be able to understand their limitations.

(6) Engineer and society relations: they should be able to conduct reasonable analysis based on energy and power engineering-related background knowledge, and evaluate the impact of measurement-control technology and instrument professional engineering practices and complex engineering problem solutions on society, health, safety, law, and culture, and understand their responsibilities.

(7) Environment and sustainable development: they should be able to understand and evaluate the impact of engineering practices on complex engineering issues in measurement-control technology and instrument field of energy and power related industries on environmental and social sustainable development.

(8) Professional standard accomplishment: they should have humanities and social sciences literacy and social responsibility, be able to understand and abide by engineering professional ethics and norms, and perform their responsibilities in engineering practice in measurement-control technology and instrument field of energy and power related industries.

(9) Individual and team competence: they should be able to assume the roles of individuals, team members, and leaders in teams with multidisciplinary backgrounds.

(10) Communication: they should be able to effectively communicate and communicate with

industry peers and the public on complex engineering issues in measurement-control technology and instrument field of energy and power related industries, including writing reports and design manuscripts, making statements, expressing or responding to explanations, and has a certain international vision, able to communicate and communicate in a cross-cultural background.

(11) Project management: they should be able to understand and master engineering management principles and economic decision-making methods in the field of measurement-control technology and instrument, and be able to apply them in a multidisciplinary environment.

(12) Lifelong learning: they should have the consciousness of independent learning and lifelong learning, and have the ability to learn and adapt to development.

四、学时与学分 Hours and Credits

类别		学时	学分	比例
必修课 Required courses	公共基础 Public infrastructure	644	33	19.41%
	学科门类基础 Basis of discipline	560	35	20.59%
	专业类基础 Basis of major	300	18.5	10.88%
	专业核心 Required courses of major	472	29.5	17.35%
	集中实践 Intensive practice	208 学时+17 周 208 class hours + 17 weeks	29	17.06%
必修课小计 Subtotal of Required courses		2184 学时+17 周 2184 class hours + 17 weeks	145	85.30%
选修课 Electives		320	20	11.76%
课外实践学分 Practice credits of extra-curricular		5 周 5 weeks	5	2.94%
总计 Total		2504 学时+22 周 2504 class hours + 22 weeks	170	100%

说明:

必修实践环节学分包括:集中实践课程 29 学分,课外实践课程 5 学分,学科门类基础、专业基础课程中的实验课程 6.5 学分,学科门类基础、专业基础、专业必修课程中的实验、上机学时折算 4.5 学分,共计 45 学分,占总学分 26.47%。

Note:

Total of 44 credits for required practice training, accounting for 26.47% of the total credits, including: 29 credits for Intensive practice, 5 credits for practice credits of extra-curricular, 6.5 credits for basis of discipline and basis of major, 4.5 credits for experiment and computer practice in basis of discipline, basis of major, and required courses of major.

五、专业主干课程 Main Course

传感器原理与应用、微机原理与嵌入式系统、数字信号处理基础、过程参数检测技术、自动控制理论、过程控制系统、控制装置与系统、智能仪器设计、顺序控制、清洁能源发电设备及测控技术。

Principle and application of sensors, microcomputer principle and embedded system, fundamentals of digital signal processing, process parameter detection and Instrument, automatic control theory, process control system, control device and system, intelligent instrument, switch control, clean energy power generation equipment and measurement and control technology.

六、总周数分配 Arrangement of the Total Weeks

学期 Semester 教学环节 Teaching Program	一	二	三	四	五	六	七	八	合计
理论教学 Theory Teaching	18	17	17	16	17	16	17	2	121
复习考试 Review and Exam	2	2	3	1	1	1	3	0	13
集中实践环节 Intensive Practice	2	2	0	3	3	3	0	16	28
小计 Subtotal	22	21	20	20	21	20	20	18	162
寒假 Winter Vacation	5		5		5		5		20
暑假 Summer Vacation		6		6		6			18
合计 Total	27	27	25	26	26	26	25	18	200

测控技术与仪器专业必修课程体系及教学计划

Table of Teaching Schedule for Required Course and Teaching Plan

类别 Type	课程编号 Course ID	课程名称 Course name	学分 Credits	总学时 Hours	课内学时 In class hours	实验学时 Lab hours	课外学时 Off class hours	开课学期 Semester
公共基础类课程 Public basic courses	00700975	中国近现代史纲要 Outline of Modern Chinese History	3	48	32		16	2
	00701353	思想道德与法治 Ideology and Moral Cultivation & Law Basis	3	48	32		16	1
	00700983	毛泽东思想和中国特色社会主义理论体系概论 Mao Zedong Thought and the Theory of Building Socialism with Chinese Characteristics	3	48	32		16	3
	00700971	马克思主义基本原理 Marxist Theory	3	48	32		16	3
	00700988	习近平新时代中国特色社会主义思想概论 Outline of Xi Jinping's New China's Socialist Ideology	3	48	32		16	2
	00701661-00701668	形势与政策 Current Affair and Policy	2	64	64			1-8
	01390011	军事理论 Military Theory	2	36	24		12	1
	J100010	现代电力工程师 Modern Power Engineer	2	32	32			2
	00801410	通用英语 General English	4	64	64			1
	00801400	学术英语 Academic English	4	64	64			2
	01000011	体育(1)Physical Education (1)	1	36	30		6	1
	01000021	体育(2)Physical Education (2)	1	36	30		6	2
	01000031	体育(3)Physical Education (3)	1	36	30		6	3
	01000041	体育(4)Physical Education (4)	1	36	30		6	4
	公共基础课程小计 Subtotal of public basic courses			33	644	528		116
学科门类基础课程 Basis of discipline	00900130	高等数学(1) Advanced Mathematics (1)	5.5	88	88			1
	00900140	高等数学(2) Advanced Mathematics (2)	6	96	96			2
	00900462	线性代数 Linear Algebra	3	48	48			2
	00900111	概率论与数理统计 Probability and Mathematical Statistics	3.5	56	56			4
	00900090	复变函数与积分变换 Complex Function and Integral Transformation	3	48	48			3
	00900053	大学物理(1) College Physics (1)	3.5	56	56			2
	00900440	物理实验(1) Experiment of Physics (1)	2	32		32		2

类别 Type	课程编号 Course ID	课程名称 Course name	学分 Credits	总学时 Hours	课内学时 In class hours	实验学时 Lab hours	课外学时 Off class hours	开课学期 Semester
	00900064	大学物理(2) College Physics (2)	3	48	48			3
	00900450	物理实验(2) Experiment of Physics (2)	2	32		32		3
	00600204	C/C++程序设计 C/C++ Language Programming	3.5	56	36	20		1
	工程基础类课程小计 Subtotal of Engineering foundation		35	560	476	84		
专业基础类课程 The major basic courses	00600233	工程制图基础 Engineering Graphics	2	32	32			2
	10310610	自动化概论 Introduction to Automation	0.5	8	8			2
	00200491	电路分析基础 Circuit Analysis Fundamentals	3.5	56	56			3
	00200522	电路实验 Experiment of Circuit Analysis Fundamentals	0.5	8		8		3
	00500351	模拟电子技术基础 Fundamentals of Analogue Electronics Technology	3	48	48			3
	00500172	模拟电子技术基础实验 Experiment of Fundamentals of Analogue Electronics Technology	1	16		16		3
	00500410	数字电子技术基础 Fundamentals of Digital Electronics Technology	3	48	48			4
	00500180	数字电子技术基础实验 A Experiment of Fundamentals of Digital Electronics Technology A	1	20		20		4
	00200611	发电厂动力部分 Power Part of Power Plant	2	32	32			4
	00400340	误差理论与数据处理 Error Theory and Data Processing	2	32	32			4
	专业基础类课程小计 Subtotal of The major basic courses		18.5	300	256	44		
专业核心课程 Required courses of major	00400700	自动控制理论 A Automatic Control Theory A	4	64	58	6		5
	10141180	微机原理与嵌入式系统 Microcomputer Principle and Embedded System	3.5	56	46	10		5
	00400041	传感器原理与应用 Principle and Application of Sensors	3	48	44	4		5
	10141170	数字信号处理基础 A Fundamentals of Digital Signal Processing A	2.5	40	40			5
	10141280	过程参数检测技术 A Process Parameter Detection Technology A	3	48	42	6		6
	10141261	清洁能源发电设备及测控技术 Clean Energy Power Generation Equipment and Measurement and Control Technology	2	32	28	4		6
	10141190	过程控制系统 B Process Control System B	3	48	40	8		6
	00400730	顺序控制 Sequence Control	2	32	26	6		6

类别 Type	课程编号 Course ID	课程名称 Course name	学分 Credits	总学时 Hours	课内学时 In class hours	实验学时 Lab hours	课外学时 Off class hours	开课学期 Semester
	00400690	智能仪器设计 Design of Intelligent Instrument	2	32	28	4		6
	00400181	计量测试技术 Metrology and Measurement Technique	2	32	28	4		7
	00400621	控制装置与系统 Control Device and System	2.5	40	36	4		7
	专业核心课程小计 Subtotal of Required courses of major		29.5	472	416	56		
必修课学分合计 Subtotal of Required courses			116					

测控技术与仪器专业部分集中实践环节设置

Table of Teaching Schedule for Main Practical Training

类别 Type	课序号 ID	环节名称 Name	学分 Credits	周数 Weeks	学时数 Hours	开课 学期 Semester
必修 Required	01390012	军事技能 Military Training	2	2 周		1
	J100060	劳动教育 Labor Education	2	2 周		4
	00490170	认识实习 Acquaintanceship Practice	1	1 周		4
	00490321	火电厂运行仿真实践 B Simulation-based Operation and Practice Training for of Thermal Power Plant B	1	1 周		8
	00390200	金工实习 Metalworking Practice	2	2 周		2
	00490060	传感器综合实践 Comprehensive Practice of Sensors	1	1 周		5
	00690820	数字信号处理基础 A 课程设计 Course Design for Fundamentals of Digital Signal Processing A	1	1 周		5
	00690830	微机原理与嵌入式系统课程设计 Course Design for Microcomputer Principle and Embedded System	1	1 周		5
	00690840	智能仪器设计综合实践 Comprehensive Practice of Intelligent Instrument	1	1 周		6
	00490110	过程参数检测技术 A 课程设计 Course Design for Process Parameter Detection Technology A	1	1 周		6
	00690860	过程控制系统 B 课程设计 Course Design for Process Control System B	1	1 周		6
	00690021	毕业设计 Graduation Project	13		208	7-8
	00490300	仪器仪表实训 Instrumentation Practice	1	1 周		8
	00490043	毕业实习 Major Practice	1	1 周		8
	00490010	毕业教育 Graduation Education	0	1 周		8
集中实践小计 Subtotal of major practical training			29	17 周	208	

测控技术与仪器专业选修课教学进程

Table of Teaching Schedule for Electives

选修课程分为专业领域课程、其它专业课程、通识教育课程 3 个部分，总学分不低于 20 学分。其中，专业领域课程和其它专业课程学分不低于 12 学分。学生可根据自身情况、兴趣爱好等进行选课。

Elective courses are divided into 3 parts: major courses, general education courses, other major courses. The total elective credits are not less than 20 credits total credits, and the total courses including major courses and other major courses are not less than 12 credits total credits. Students can choose courses according to their own situation and interests.

1. 专业领域课程 Major field courses

专业领域课程旨在培养学生在该专业某领域内具备综合分析、处理（研究、设计）问题的技能及专业前沿知识。本专业领域的选修课程如下表所示。

Major field courses aim to develop students' skills and advanced knowledge of comprehensive analysis, processing (research, design) problems in a certain field of the major. Elective courses in this field are shown in the following table.

2. 其他专业课程 Other major courses

为了培养复合型人才，鼓励学生跨专业选修课程。学生可以选修我校开设的任何专业的课程。

In order to cultivate compound talents, students should be encouraged to cross major elective courses. Students can take any courses offered by our university.

3. 通识教育课程 General education curriculum

通识教育课程包括人文社科、语言交流、文化艺术、科学技术、经济管理、创新创业等模块，学生从学校给定的通识教育课程中选择。

General education curriculum includes humanities and social sciences, language communication, culture and art, science and technology, economic management, innovation and entrepreneurship modules. Students choose from general education courses offered by the university. The courses “Introduction to environmental protection and sustainable society” and “Engineering Project Management” are suggested to be selected.

组别	课程编号	课程名称	学分	总学时	课内学时	实验学时	课外学时	开课学期	模块	
1	模块 1	00400100 工程光学 Engineering Optics	2	32	32			4	总学分 不少于 12 学分 Electives, not less than 12 credits	
		00400710 现代控制理论 Theory of Modern Control	2	32	32			6		
		10141220 发电过程建模与辨识 Modeling and identification of power generation	2	32	28	4		5		
		00400450 专业英语阅读(测控) Professional English Reading (Measurement and Control)	2	32	32			7		
		00400420 仪表可靠性基础 Fundamentals of Instrument Reliability	2	32	32			7		
		10410240 人工智能导论 Principles and Methods of Artificial Intelligence	1	16	16			7		
	模块 2	11111494 无线传感器网络 Wireless sensor network	2	32	32			7		
		10141200 测控软件技术 Measurement and Control Software Technology	1	16	16			7		
		10141210 测控总线技术 Measurement and Control Bus Technology	1	16	16			7		
		00400670 虚拟仪器技术(研讨型) Virtual Instrument Technology (seminar type)	2	32	32			7		
		00400600 检测新技术(研讨型) New Detection Technology (seminar type)	2	32	32			5		
	模块 3	10411070 热工及流体基础 Thermal and Fluid Machinery Fundamentals	2	32	32			4		
		00400610 控制系统数字仿真与参数优化 Control System Digital Simulation and Parameter Optimization	2	32	32			6		
		00200080 电磁测量技术 Electromagnetic Measurement Technology	2	32	32			5		
		00200192 电力电子技术 B Power Electronics Technology B	2	32	32			5		
	模块 4		跨专业选修其他专业的专业课程 Interdisciplinary Electives					2-8		
	2		通识教育选修课程 General Education Electives					2-8		公共艺术 类课程至少 选修 2 学分; 其它可用组 别 1 中课程 学分替代
选修课总学分不低于 20 学分。其中, 组别 1 中的专业领域课程和其它专业课程学分不低于 12 学分。										

选修课选课建议: Recommendations for electives

1. 第二、第三学期: 建议每学期选修通识教育选修课程模块中的课程 1-2 门。
2. 第四、五、六、七、八学期: 建议每学期从专业选修课各模块中选修 1-3 门课程; 也可根据个人兴趣, 跨专业选修其他专业的专业课程。
 1. Second and third semesters: It is recommended to select 1-2 courses in **General Education Electives** every semester.
 2. Fourth, fifth, sixth, seventh, and eighth semesters: It is recommended to choose 1-3 courses from each part of electives each semester; you can also select **Interdisciplinary Electives** based on personal interests.

辅修测控技术与仪器专业人才培养方案

Undergraduate Program for the Measurement-Control Technology and Instrument Minor

组别	课程编号	课程名称	学分	总学时	课内学时	实验学时	开课学期	备注
A	00400700	自动控制理论 A Automatic Control Theory A	4	64	60	4	5	
	10141180	微机原理与嵌入式系统 Microcomputer Principle and Embedded System	3.5	56	46	10	5	
	00400041	传感器原理与应用 Principle and Application of Sensors	3	48	44	4	5	
	10141170	数字信号处理基础 A Fundamentals of Digital Signal Processing A	2.5	40	40		5	
	10141280	过程参数检测技术 A Process Parameter Detection Technology A	3	48	42	6	6	
	00400621	控制装置与系统 Control Device and System	2.5	40	32	8	7	
	10141190	过程控制系统 B Process Control System B	3	48	40	8	6	
	00400730	顺序控制 B Sequence Control B	2	32	24	8	6	
	00400690	智能仪器设计 Design of Intelligent Instrument	2	32	24	8	6	
	10141261	清洁能源发电设备及测控技术 Clean Energy Power Generation Equipment and Measurement and Control Technology	2	32	28	4	6	
	00400181	计量测试技术 Metrology and Measurement Technique	2	32	28	4	7	
B	00690021	毕业设计 Graduation Project	13				7-8	
学分合计 Subtotal of courses			42.5					

说明：1.辅修专业需修读 A 组课程，计 29.5 学分；
2.辅修专业学士学位需修读 A、B 两组课程，计 42 学分。