

**河南理工大学利莫瑞克国际学院  
硕士研究生专业培养方案**

**Limerick International College at  
Henan Polytechnic University  
Cultivation Program for Postgraduates**

# 控制科学与工程专业硕士研究生人才培养方案

## Cultivation Program for Postgraduates of Control Science and Engineering

专业代码：081100      所属学科门类：工学（08）

### 一、学科简介

“控制科学与工程”是一门研究控制的理论、方法、技术及其工程应用的学科，以控制论、系统论、信息论为基础，研究各应用领域内的共性问题。它对于各具体应用领域具有一般方法论的意义，而与各领域具体问题的结合，又形成了控制工程丰富多样的内容。本学科在理论研究与工程实践结合、学科交叉和军民结合等方面具有明显的特色与优势，服务领域覆盖互联网、人工智能、通信、IT、智能制造、金融管理、教育咨询、科学研究等经济和安全领域，工作形式涵盖技术研发、管理咨询、教学科研等。同时，相邻学科如计算机、通信、微电子学和认知科学的发展，特别是近 20 年来，非线性及具有不确定性的复杂系统对“控制科学与工程”提出了新的挑战，进一步促进了本学科的迅速发展，使本学科所涉及的研究领域不断扩大。

本专业通过引进爱尔兰利莫瑞克大学的先进办学理念和优质教育资源，教学方法和办学经验，结合河南理工大学控制科学与工程学科专业优势，通过双方教师联合授课、双语教学的方法，共建利莫瑞克国际学院控制科学与工程学科硕士研究生专业。河南理工大学“控制科学与工程”始于上世纪 60 年代，1982 年开始培养硕士研究生，2012 年获批河南省一级重点学科，目前该学科还拥有“矿业控制工程”交叉学科博士点。结合利莫瑞克大学优势学科，在工业过程控制、复杂系统建模与控制、模式识别与智能控制等方向形成了优势和特色。毕业生可从事现代工业、农业、国防自动化设备中控制系统和装置的理论研究、应用设计与开发。

### I. Introduction

Control Science and Engineering is a discipline that studies the theory, method, technology and engineering application of control. Based on cybernetics, system theory and information theory, it studies the common problems in various application

fields. It has general methodological significance for each specific application field, and the combination with specific problems in each field forms a rich and diverse content of control engineering. This discipline has obvious characteristics and advantages in the combination of theoretical research and engineering practice, interdisciplinary and military civilian integration, and has played an important role in economic development and national security. The service fields cover the Internet, artificial intelligence, communication, IT, intelligent manufacturing, financial management, educational consultation, scientific research and other fields, and the work forms cover technology research, management consulting, teaching and scientific research, etc. At the same time, the development of adjacent disciplines such as computer, communication, microelectronics and cognitive science, especially in the past 20 years, nonlinear and uncertain complex systems have posed new challenges to control science and Engineering, further promoted the rapid development of this discipline and expanded the research fields involved in this discipline.

The Postgraduate of Control Science and Engineering at LICHPU is constructed by introducing the advanced ideas, high-quality educational resources, teaching methods and educational experience of running school from the UL, Ireland, and jointly with exploiting the major advantage at HPU. Through the teachers' joint teaching, bilingual teaching, establish the Postgraduate of Control Science and Engineering jointly at LICHPU. Control Science and Engineering in HPU established in the 1960s, and it was awarded the authorization of master's degree programs in 1982. In 2012, the discipline was approved as a primary key discipline of Henan Province. Till now, Doctor of Mining Control Engineering, an interdisciplinary, has also been approved to be granted under the discipline. Combined with the advantages of UL, it has developed advantages and special characteristics in industrial process control, complex system modeling and control, pattern recognition and intelligent control, and other directions. Graduates from the discipline may engage in theoretic research and application design and development of control systems and devices for modern industrial, agricultural and national defense automation equipment.

## **二、培养目标**

坚持社会主义办学方向，立德树人，努力培养具有健全人格、良好职业道德和良好学术素养，具有一定独立从事科学研究工作能力的高素质创新人才。通过中外双方联合培养，具体培养目标如下：（1）服从国家需要，立志为社会

主义现代化建设事业服务，能适应社会、经济和科学技术发展。（2）具有实事求是、勇于钻研、严谨诚信的科学精神，在“控制科学与工程”领域掌握坚实宽广的基础理论、了解控制科学与工程学科发展的前沿和动态，系统深入的专业知识和必要的实验技能。（3）掌握坚实的控制科学理论知识与专业知识，具备先进控制工程技术应用技能，具有从事控制系统、设备或装置的开发设计、工艺设计和实施等能力。（4）具有从事科学研究工作或独立承担专门工程技术工作的能力，能够独立解决本学科有关工程应用中出现的实际问题。（5）具备娴熟的英语听说读写能力及全球化国际视野，能熟练地阅读专业文献资料，具备进行国际学术交流的能力。（6）了解国际产业规则，具有较强的团队合作精神和跨文化交流能力，能够综合运用本专业的基础理论和实践知识，在控制科学与工程领域的国际化组织机构进行理论研究或者从事高端业务实践工作。

## **II. Cultivation Objectives**

Sino-foreign cooperative education adhere to the socialist direction of running schools, cultivate talents with moral integrity, and strive to cultivate high-quality innovative talents with sound personality, good professional ethics and academic quality, as well as the ability to engage in scientific research independently. Through the joint training of Chinese and foreign parties, the specific training objectives are as follows: (1) Obeying the needs of the state and determined to serve the cause of socialist modernization can adapt to social, economic, scientific and technological development. (2) With the scientific spirit of seeking truth from facts, courage to study, preciseness and integrity, master solid and broad basic theories in the field of “control science and Engineering”, understand the frontier and dynamics of the development of control science and engineering, systematic and in-depth professional knowledge and necessary experimental skills. (3) Master solid theoretical basic knowledge and professional knowledge of control science, have advanced control engineering technology application skills, and have the ability to engage in the development, design, process design and implementation of control systems, equipment or devices. (4) Have the ability to engage in scientific research or undertake special engineering and technical work independently, and be able to independently solve practical problems in engineering application of this discipline. (5) Be proficient in English listening, speaking, reading and writing, global

international vision, proficient in reading professional documents and materials, and the ability to carry out international academic exchanges. (6) Understand international industrial rules, have strong teamwork spirit and cross-cultural communication ability, and be able to comprehensively use the basic theoretical and practical knowledge of this major to conduct theoretical research or engage in high-end business practice in international organizations in the field of control science and engineering.

### **三、主要研究方向**

#### **1. 复杂系统建模与控制**

以复杂系统为对象，利用网络化环境，以复杂系统分析的理论和方法解决工程、社会、经济和国防中的复杂系统建模、分析、控制和优化等问题。研究领域主要包括：预测控制，鲁棒控制，大系统理论与递阶控制，时滞系统控制，非线性系统控制，随机系统滤波，估计与适应控制，机器人网络控制等；研究相关理论及控制技术在供配电系统、工矿企业生产系统、智能交通系统、机器人等领域的应用。

#### **2. 工业过程控制**

针对工业过程控制问题，开展生产过程建模、系统集成、优化与控制的理论及方法研究。研究领域主要包括：工业过程控制系统建模与仿真，新一代主控系统，现场总线控制技术，先进过程控制理论及应用，过程优化理论及应用，工业过程控制系统。

#### **3. 检测技术与自动化**

以智能仪器仪表、大型机电设备为对象，进行信号检测与处理、机电设备状态监测与故障诊断等方面的理论与方法研究。研究领域主要包括：信号分析与处理、智能检测理论及其应用、机电设备状态监测与故障诊断、数据融合技术、传感器技术、测控一体化技术、网络化仪器仪表、嵌入式系统与智能仪器仪表。

#### **4. 运动驱动与控制**

主要研究复杂运动体的驱动与控制，先进运动控制理论与方法，嵌入式控制器与驱动技术，高精度数字同步传动和伺服系统，特种电机驱动控制，运动控制系统的性能测试与故障诊断，导航制导，运动体的轨道与姿态控制。

#### **5. 模式识别与智能控制**

主要研究信息的采集、处理与特征提取，模式识别与分析，视频图像背景分离与运动物体识别，图像理解与识别，计算机视觉，机器人控制，人工智能及智能系统。

### **III. Major Research Approaches**

#### **1. Complex System Modeling and Control**

It models, analyzes, controls and optimizes complex engineering, social, economic and national defense systems using theories and methods of complex system analysis under a networked environment. Research fields mainly include predictive control, robust control, large scale system theory and hierarchical control, time-delay system control, nonlinear system control, stochastic system filtering, estimation and adaptive control, robot network control, etc. Research theories and control technologies related to it are applied to power supply and distribution systems, production systems of industrial and mining enterprises, intelligent transportation systems and robots.

#### **2. Industrial Process Control**

It studies the theories and methods of production process modeling and system integration, optimization and control to solve problems in industrial process control. Research fields mainly include modeling and simulation of industrial process control systems, new generation master control systems, fieldbus control technology, advanced process control theory and application, process optimization theory and application, and industrial process control systems.

#### **3. Detection Technology and Automation**

It studies the theories and methods of signal detection and processing, state monitoring and fault diagnosis of intelligent instruments and large electromechanical equipment. Research fields mainly include signaling analysis and processing, intelligent detection theory and application, state monitoring and fault diagnosis of electromechanical equipment, data fusion technology, sensor technology, measurement-control integration technology, networked instruments, embedded systems and intelligent instruments.

#### **4. Motion Drive and Control**

It mainly studies the driving and control of complex moving bodies, advanced motion control theories and methods, embedded controller and driving technology, high-precision digital synchronous drive and servo systems, special motor driving control, performance testing and fault diagnosis of motion control systems, navigation guidance, and orbit and attitude control of moving bodies.

### **5. Pattern Recognition and Intelligent Control**

It mainly studies the collection, processing and feature extraction of information, pattern recognition and analysis, video image background separation and moving body recognition, image understanding and recognition, computer vision, robot control, artificial intelligence, and intelligent systems.

## **四、学制及学习年限**

学制一般为 3 年，学习年限最长不超过 4 年。

### **IV. Length**

The program duration is 3 years, and students may at most spend 4 years pursuing the degree.

## **五、课程设置、必修环节及学分要求**

课程包括必修课（公共必修课、专业必修课）、选修课和补修课三个部分，在规定的学习期限内所修总学分不少于 30 学分（含必修环节）。跨专业或以同等学力考取的硕士研究生，应补修本专业本科主干课程不少于 2 门，补修课程由导师确定，并应在课程计划中列出。所有课程学习一般应在入学后 1 年内完成。

必修环节 4 学分，主要包括开题报告、学术活动以及科学道德与学术规范三部分。课程设置、必修环节及学时、学分的分配见下表。

### **V. Courses, Compulsory Part and Credit Requirements**

Courses include compulsory courses (public compulsory courses, professional compulsory courses), elective courses and make-up courses. Within the specified learning period, the total credits taken shall not be less than 30 credits (including compulsory links). Cross-major students or those passing the exam with the same educational level should take, by self-study or with the undergraduates, at least two

primary undergraduate courses under the major, which shall be determined by their supervisors and listed in their curricula. The study of all such courses should be finished in 1 year after enrollment.

The compulsory part, composed of the opening report, academic activities and scientific ethics and academic norms, accounts for 4 credits. See the following table for details of the courses, compulsory part, class hours and credits.

### 课程设置、必修环节及时、学分配表

#### List of Courses, Compulsory Part, Class Hours and Credits

课程类别 Category	课程编号 Course NO	课程名称 Course Title	课程来源 Course Source	教师来源 Teacher Source	学时 Hrs	学分 Crts	开课学期 Semester	备注 Remarks	
必修课 Required	公共必修 Public Required	M1161001	★综合英语 Comprehensive English	引进课程	外方	36	2	1	通识课程 General Course
		M1161002	★学术英语 Academic English	引进课程	外方	54	3	2	通识课程 General Course
		M1121001	中国特色社会主义理论与实践研究 Theory and Practice of Socialism with Chinese Characteristics	中方	中方	36	2	1	通识课程 General Course
		M1121002	自然辩证法 Dialectics of Nature	中方	中方	18	1	2	通识课程
		M1111007	矩阵理论 Matrix Theory	中方	中方	60	2	1	通识课程 General Course
	专业必修 Specialized Required	M1085001	★分布式系统 Distributed Systems	引进课程	外方	36	2	1	专业核心课程 Specialized Core Course
		M1085002	★实时系统 Real-Time Systems	引进课程	外方	36	2	1	专业核心课程 Specialized Core Course
		M1083003	线性系统理论(精品课程) Linear Systems Theory (qualify course)	中方	中方	36	2	1	专业核心课程 Specialized Core Course
		M1085003	★机器学习与数据工程导论 Introduction to Machine Learning And Data Engineering	引进课程	外方	36	2	2	专业核心课程 Specialized Core Course
		M1085004	★边缘深度学习 Deep Learning at the Edge	引进课程	外方	36	2	2	专业核心课程 Specialized Core Course
		M1085005	★测试开发工程 Test Development Engineering	引进课程	外方	36	2	2	专业核心课程 Specialized Core Course
	专业选修课 Professional Optional	M1085006	★高级数字系统设计 Advanced Digital Systems Design	引进课程	外方	36	2	2	专业课程 Specialized Course
M1085007		★数字控制 Digital Control	引进课程	外方	36	2	2	专业课程 Specialized Course	



	M1085008	★应用云计算 Applied Cloud Computing	引进课程	外方	36	2	2	专业课程 Specialized Course
	M1083012	现代故障诊断技术(优质课程) Modern Fault Diagnosis Technology (quality course)	中方	中方	36	2	2	专业课程 Specialized Course
	M1083017	智能控制理论与应用(双语) Theory and Application of Intelligent Control (bilingual course)	中方	中方	36	2	2	专业课程 Specialized Course
	M1083005	复杂系统控制理论 Theory of Complex System Control	中方	中方	36	2	2	专业课程 Specialized Course
	M1083008	高级过程控制与系统 Advanced Process Control and Systems	中方	中方	36	2	2	专业课程 Specialized Course
	M1083011	现代测控技术与系统 Modern Measurement and Control Technology and Systems	中方	中方	36	2	2	专业课程 Specialized Course
	M1083014	先进运动控制 Advanced Motion Control	中方	中	36	2	2	专业课 Professional course
	M1083006	系统辨识与自适应控制 System Recognition and Adaptive Control	中方	中方	36	2	2	专业课程 Specialized Course
Remedial course 补修课	M1083026	电力电子技术 Power Electronic Technology	中方	中方	\	0	1-2	非学位课
	M1083027	电力拖动与控制系统 Electric Traction and Control Systems	中方	中方	\	0	1-2	非学位课
	M1083028	微机原理与单片机接口技术 Principle of Microcomputer and Mono-Chip Computer & Interface Technology	中方	中方	\	0	1-2	非学位课
	M1083029	Principle of Automatic Control	中方	中方	\	0	1-2	非学位课
Compulsory 必修环节	MBXHJ01	开题报告 Opening report	中方		\	1	3	----
	M001004	中期考核 Mid-term examination	中方		\	0	4	----
	MBXHJ02	学术活动≥10次 Academic activities ≥10	中方		\	2	1-6	----
	MBXHJ03	科学道德与学术规范 Scientific ethics and academic norms	中方		\	1	1	非学位课

注：1. 根据研究生基础和专业方向，选修课不少于2门。

2. 列表中加星号★为外方引进课程，共10门。

Note: 1. According to the basic and major research approaches, there should be no less than 2 optional courses.

2. There are 10 introduced courses in total with ★ in the list.

## 六、论文环节

研究生在完成课程学习任务，满足课程学分要求后，进入学位论文研究阶段，论文需用英文撰写。

### 1. 开题报告

开题是硕士研究生学位论文工作的重要环节。硕士研究生应根据所选定的研究方向和学位论文水平要求，系统地查阅国内外文献（一般不少于 80 篇，其中外文文献一般不少于 30 篇，具体要求由学科确定），在对本学科专业研究方向的国内外发展动态有较全面的了解后，撰写不少于 5000 字的开题报告。

硕士研究生应在入学后第 3 学期开题。开题报告会由所在学院负责，按学科或研究方向组成 3-5 人的开题报告专家小组，专家应为本学科或相近学科的高级职称人员或研究生导师。开题通过者，获得 1 个学分。开题未通过者，可在三个月内再进行一次，第二次仍不合格者，终止培养。

### 2. 中期考核

中期考核包括思想品德、课程学习、选题开题三个方面。硕士研究生中期考核工作于第 4 学期进行，由学院统一组织，由相近学科 3-5 位专家组成考核组，考核组专家根据硕士研究生汇报情况逐个进行评议。并按优秀、合格、不合格，给出综合考核成绩。考核合格及以上者，进入学位论文下一阶段工作；不合格者，终止培养。

### 3. 学术活动

研究生学习期间须参加各种学术活动，并填写学术活动记录表，记录学术活动内容和收获。

学术学位硕士研究生要求至少公开做学术报告 1 次，或参加国内外学术会议 1 次。学术报告考核通过计 2 学分。

## VI. Thesis

Graduate students may advance to dissertation section after completion of taught courses studies and satisfied the required credits, the dissertation should be written in English.

### 1. Opening Report

Opening report is an important part of the theses of students. Each student should, in the 3rd semester after enrollment and based on the selected research approach and degree thesis requirements, write an opening report of 5,000 words or more after systematically consulting domestic and foreign literature (at least 80, generally, including at least 30 foreign literature, to be determined by the discipline) and fully learning domestic and foreign development trends of the research approach under his/her major under the discipline.

The school of the students should hold an opening report review meeting chaired by an opening report expert panel composed of three to five senior professionals or postgraduate supervisors of the discipline or research approach concerned or disciplines related. Students who get their opening reports approved will get 1 credit. Those who fail to get their opening reports approved shall undergo the review once again in three months. Those who still fail the review will be disqualified from the program.

## **2. Mid-term Examination**

Mid-term examination assesses moral quality, course learning and topic determination and opening. Students undergo mid-term examinations uniformly organized by their schools in the 4th semester. Three to five experts of related disciplines will form a review panel to assess the presentations of students one by one and rated them comprehensively as excellent, qualified and unqualified. Students rated excellent and qualified shall proceed to the next stage of their theses, and those rated unqualified will be disqualified from the program.

## **3. Academic Activities**

Graduate students should participate in various academic activities and fill in the academic activity record form to record the content and harvest of academic activities.

Academic master degree students are required to make an academic report publicly at least one time or to attend an academic conference, domestic or abroad, one time. Students can obtain 2 credits if passing the academic report examination.

# **七、论文评审和答辩**

1. 论文评审：审核论文作者掌握本领域坚实的基础理论和系统的专业知识的情况；综合运用科学理论、方法和技术手段解决工程技术问题的能力；掌握

科学研究的一般方法，对控制科学与工程基础理论或工程实践中出现的问题，善于创造性思维，提出独特的见解和创新研究。

2. 评审方式：全日制学术学位研究生学位论文必须两位本领域或相关领域专家评阅，在全国范围内进行双盲制评审，论文均通过双盲制评审后方可进行毕业答辩。

3. 答辩组织：答辩委员会由 3-5 位本领域或相关领域专家组成。

## **VII. Thesis Review and Defense**

1. Thesis review: A thesis shall be reviewed for whether its author has solid fundamental theories and systematic professional knowledge in the field, be able to solve technical engineering problems using scientific theories, methods and techniques, has learned the general methods of scientific research, and be good at creative thinking when facing problems arising from fundamental theories and engineering practices of control science and engineering to put forward unique insights and innovative studies.

2. Review process: Degree theses of full-time postgraduates of academic degrees shall be reviewed by two experts in the field or related fields, and be reviewed by the nationwide double-blind system. Students shall proceed to graduation thesis defenses only after they have their theses approved in both reviews.

3. Defense: The defense committee shall be composed of three to five experts in the field or related fields.

## **八、毕业和学位授予**

在规定年限内，学生修完本专业人才培养方案规定的学分，通过双方联合组织的研究生毕业论文答辩，德、智、体各方面达到毕业要求，准予毕业，由河南理工大学颁发研究生毕业证书。报河南理工大学学位委员会审定后，河南理工大学颁发硕士学位证书；研究生雅思成绩达到 6.5（单科不低于 6.0）或者通过利莫瑞克大学英语语言测试，成绩合格，报利莫瑞克大学学位委员会审定后，利莫瑞克大学颁发硕士学位证书。学生在人才培养方案规定的修业年限内达不到毕业条件的，由河南理工大学颁发结业证书，利莫瑞克大学出具学习证明。

## **VIII. Graduation and Degree Granting**

Within the specified number of years, the student who has completed all the courses credits stipulated in the talent cultivation plan, passed the requirements of academic defense for the postgraduate thesis, which jointly organized by both parties, and met the graduation requirements in moral, intellectual and physical aspects, will be granted graduation, and awarded the postgraduate graduation certificate of HPU. After being approved by HPU's Degree Committee, student will be awarded master degree of HPU. After being approved by UL's Degree Committee, postgraduate student who has achieved IELTS score of 6.5 (no less than 6.0 for each item) or passed the English Language Test of UL, will be awarded master degree. If the student fails to meet the graduation requirements within the length of the programs specified in the talent cultivation plan, HPU shall issue the completion certificate and UL shall issue study certificate.