

电子科学与技术留学研究生培养方案

Postgraduate Programs for International Students Majoring in

Electronics Science and Technology

(专业代码: 0809)

(Subject code: 0809)

本培养方案依据《中国科学技术大学研究生培养方案总则(2019 版)》以及《中国科学技术大学研究生院关于开展科学学位研究生培养方案修订(制定)工作的通知》以及《电子科学与技术研究生培养方案》修订。

The program is revised in accordance with *the general principles of graduate cultivation program of University of science and technology of China (2019)*, *the notice of Graduate School of USTC on Revising (formulating) the cultivation program for graduate students with science degree* and *the Cultivation Program for Postgraduates Majoring in Electronic Science and Technology (2020)*.

一、培养目标

I. Program objectives

- (一) 攻读硕士学位的留学生应掌握本学科坚实的基础理论和系统的专业知识,具有从事科学研究工作或较强的实际工作能力;

(1) International students studying for a master's degree should master solid basic theories and systematic professional knowledge of the discipline, and have strong ability to engage themselves in scientific research or practical work;

(二) 攻读博士学位的留学生应掌握本学科坚实宽广的基础理论和系统深入的专业知识，掌握科学研究的基本技能和方法，了解所从事研究方向的国际发展动态，具有独立从事科学研究和独立担负专门技术工作的能力，在科学或专门技术上能做出创造性的成果。

(2) International students studying for a doctoral degree should master the solid basic theory and systematic professional knowledge, master the basic skills and methods of scientific research, understand the international development tendency of the research direction, have the ability of independent engagement in scientific research and specialized technical work, and be able to make creative achievements on the scientific or technical expertise.

二、主要研究方向

II. Main research fields

电子科学与技术一级学科设有：①物理电子学（学科代码 080901）、②电路与系统（学科代码：080902）、③微电子学与固体电子学（学科代码：080903）、④电磁场与微波技术（学科

代码：080904）四个二级学科。

The first-level discipline of Electronic Science and Technology consists of four second-level disciplines:

- ① Physical Electronics (080901),
- ② Circuits and Systems (080902),
- ③ Microelectronics and Solid-state Electronics (080903),
- ④ Electromagnetic Field and Microwave Technology (080904).

主要研究方向包括：

Research fields comprise:

- 1.微纳器件、材料及工艺 Micro-nano devices, materials and processing
- 2.集成电路设计与设计自动化 Integrated circuit design and design automation
- 3.系统集成芯片SoC设计与应用 SoC design and its application
- 4.微机电系统 Micro electromechanical system
- 5.快电子学 Fast Electronics
- 6.数据采集与信息处理 Data acquisition and information processing
- 7.核电子学 Nuclear Electronics
- 8.光电器件研究与应用 Research and application of optoelectronic device

- 9.低温量子芯片 Low-temperature quantum chips
- 10.电磁场理论与应用 Theory and application of electromagnetic field
- 11.微波与毫米波理论与技术应用 Theory and technological application of microwave and millimeter wave
- 12.光波导理论与光波技术 Theory of optical waveguide and optical wave technology
- 13.量子信息技术 Technique of quantum information

三、课程类型和学分要求

III. Course type and credit point requirements

- 1. 公共必修课类型及学分要求：按照国际学院有关规定执行，具体要求请参照附件。

1.Types and credit point requirements of public compulsory courses:
They shall be implemented in accordance with relevant regulations of International College. Please refer to the attachment for specific requirements.

- 2. 专业课程类型及学分要求：

2.Types of specialized courses and credit points requirements:

- 1) 硕士培养模式：通过硕士留学生资格审查及招生面试，取得我校硕士研究生资格者。研究生在申请硕士学位时，除满足公共必修课的

学分要求外，取得的专业总学分不少于28学分，其中硕士学科基础课和硕士专业基础课学分要求见表一，硕士论文开题报告 2 学分。

Master's program: Applicants are supposed to pass the qualification examination and the recruitment interview of the university to obtain the qualification for master's program. For master's degree application, the total credit point obtained in major study shall not be less than 28 credit points in addition to meeting the credit points requirements of public compulsory courses. See Table 1 for the credit points requirements of basic courses and specialized basic courses, and master research proposal counts for 2 credit points.

表一：二级学科硕士留学生硕士学科基础课和专业基础课学分要求

Table 1: credit point requirements for basic courses and specialized basic courses for master students in each secondary discipline

课程类型 Course types	学分要求 Credit point requirements	
	物理电子学、微电子与 固体电子学 Physical Electronics; Microelectronics and Solid-state Electronics	电路与系统、电磁场与微波 技术 Circuits and Systems; Electromagnetic Field and Microwave Technology

公共必修课 Public compulsory courses	公共必修课类型及学分要求：按照国际学院有关规定执行，具体要求请参照附件。 Types and credit point requirements of public compulsory courses: They shall be implemented in accordance with relevant regulations of International College. Please refer to the attachment for specific requirements.	
硕士学科基础课 Basic courses for master students	总学分 ≥ 16 ，其中学科基础课学分 ≥ 8 Total credit points ≥ 16 , including basic course credit points ≥ 8	总学分 ≥ 11 ，其中学科基础课学分 ≥ 3 Total credit points ≥ 11 , including basic course credit points ≥ 3
硕士专业基础课 Specialized basic courses for master students		
开题报告 Research proposal	2	2

2) 博士培养模式：已取得硕士学位，通过我校博士留学生资格审查和招生面试，取得我校博士研究生资格者。研究生在申请博士学位时，除满足公共必修课的要求外，博士专业课学分要求见表二，博士论文开题报告 2 学分。

Doctoral program: Applicants are supposed to have obtained a master's degree, pass the examination of doctoral qualification and the recruitment

interview of the university to obtain the qualification for doctoral program.

In application for the doctoral degree, in addition to meeting the requirements of public compulsory courses, the doctoral specialized course credit points requirements are shown in Table 2, and the doctoral research proposal counts for 2 credit points.

表二： 二级学科博士留学生公共必修课和专业课学分要求

Table 2: Credit point requirements of public compulsory courses and doctoral specialized courses for international doctoral students in each second-level discipline.

课程类型 Course types	学分要求 Credit point requirements	
	物理电子学、微电子与固体 电子学 Physical Electronics; Microelectronics and Solid- state Electronics	电路与系统、电磁场与 微波技术 Circuits and Systems; Electromagnetic Field and Microwave Technology
公共必修课 Public compulsory courses	公共必修课类型及学分要求：按照国际学院有关规定 执行，具体要求请参照附件 Types and credit point requirements of public compulsory courses: They shall be implemented in accordance with	

	relevant regulations of International College. Please refer to the attachment for specific requirements.	
博士专业课 Specialized courses for doctoral students	≥ 4	
开题报告 Research proposal	2	2
专业总学分 Total credit points in major study	≥ 6	≥ 8

四、研究生培养过程要求

IV.Requirements for postgraduate training

1. 开题报告：硕士学位论文的开题报告及评审是硕士研究生培养的必要环节。开题报告的时间一般应在硕士培养阶段的第二学年内完成；开题报告由硕士生所在二级学科组织；硕士学位论文开题报告评审小组由本学科及相关学科的专家组成，人数不少于 3 人（其中具有正高级职称的硕士生导师不少于 1 人）；达到或超过三分之二的评审专家同意通过的方可通过；开题报告不通过的硕士研究生可以申请在下一学期重新开题。

- 1.Research proposal: The research proposal and the review of the dissertation of postgraduates is a necessary part of postgraduate

education. The time of the research proposal should generally be completed within the second academic year of the master's education. The second-level discipline is responsible for the research proposal; The review group of the research proposal of the postgraduates' dissertation shall be composed of at least three experts of the same discipline or related disciplines (including no less than 1 master supervisor with a senior professional title). Research proposal shall be adopted only if it is approved of by two thirds or more of the experts. Those master students who fail to pass the research proposal could apply the second time in the next semester.

博士学位论文的开题报告及评审是博士研究生培养的必要环节。开题报告的时间由博士生导师根据博士生工作进度情况确定，一般应在博士培养阶段的第三或第四学期内完成。开题报告由博士生所在二级学科组织；博士学位论文开题报告评审小组由本学科及相关学科的专家组成，人数不少于 5 人（其中具有正高级职称的专家不少于 3 人）；达到或超过三分之二的评审专家同意通过的方可通过；开题报告不通过的博士研究生可以申请在下一学期重新开题。

The research proposal and the review of the dissertation of doctoral students is a necessary part of PhD. education. The time of the research proposal is determined by the supervisor of doctoral students according to the progress of their work, but should normally be completed within

the third or fourth semester of the PhD. Education. The second-level discipline is responsible for the research proposal; The review group of the research proposal of the doctoral dissertation shall be composed of experts of the same discipline or related disciplines and it shall consist of at least five experts (including at least three doctoral supervisors with senior professional title). Research proposal shall be adopted only if it is approved of by two thirds or more of the experts. Those doctoral students who fail to pass the research proposal could apply the second time in the next semester.

2. 中期检查：博士学位论文的中期检查及评审是博士研究生培养的必要环节。中期检查最早在研究生通过开题报告之后的下一学期内进行；中期检查报告及评审由博士生所在二级学科组织；博士学位论文中期检查报告评审小组的组成及通过办法同开题报告；中期检查不通过的博士研究生可以申请在下一学期再次进行中期检查。

2. Mid-term inspection: The mid-term inspection and the evaluation of doctoral dissertation are necessary in the cultivation of doctoral students. The mid-term inspection is carried out in the first semester after the graduate students pass the research proposal. The second-level discipline is responsible for the mid-term inspection report and evaluation. The composition of the review group of the mid-term inspection report of the doctoral dissertation and the approval standard are the same as those of the research proposal; Doctoral students who do not pass the mid-term

inspection could apply for the second mid-term inspection in the next semester.

3.毕业答辩：研究生学位论文的毕业答辩应在研究生通过开题报告之后进行；具体要求参见研究生院的相关规定。

3.Graduation defense: The graduation defense of postgraduates' dissertation should be conducted after the graduate students pass the research proposal; For specific requirements, please refer to the relevant regulations of Graduate School.

3.国际学术交流：博士留学生在学期间须参加一次国际学术会议并交流学术论文，或短期出境访学一次。国际学术会议和短期出境访学后，博士留学生应及时向所在系教学秘书提交有关证明材料。

4.International Academic Exchanges: International doctoral students are required to attend an international academic conference and exchange academic papers, or go abroad for a short-term study visit. After finishing these activities, they should submit relevant supporting documents to the teaching secretary of their department in time.

4.学术报告：博士留学生在学期间必须听取不少于 15 场次的学术报告会，并得到报告会组织单位的认定。有效报告记录累计次数大于等于 15 次可以计 1 学分。

5.Academic Reports: International doctoral students must participate in at least 15 academic lectures during their studies and be recognized by the report's organization. 1 credit point can be counted if the total number

of valid report records is more than 15.

注：第2条和第5条，物理电子学和微电子与固体电子学方向博士生不做硬性要求；第4条，电路与系统、电磁场与微波方向博士生不做硬性要求。

Note: In article 2 and article 5, there is no mandatory requirement for doctoral students in Physical Electronics and Microelectronics and Solid-state Electronics. In article 4, there is no mandatory requirement for doctoral students in the Circuits and Systems, Electromagnetic and Microwave.

五、选课要求和课程设置列表

V. Course selection requirements and course lists

1. 公共必修课由国际学院统一设置和要求。

1.Public compulsory courses are uniformly set and required by International College.

2. 超出学分要求的基础课，学生可以申请调整为专业选修课；专业课不可以替换基础课。

2. For basic courses that beyond the credit point requirements, students can apply for turning them into specialized elective courses; Specialized courses cannot replace basic courses.

3. 硕士研究生专业课选修必须由导师签字确定，无导师签字自选课程不计学分。硕士研究生中途由其他专业转入本专业的，应按照

本专业课程要求补修课程，已修课程符合本专业课程要求的，可以计入学位课程学分。

3.The courses that master students select must be confirmed and signed by their supervisors. The optional courses without the signature of their supervisors do not count the credits. If a postgraduate student transfers from another major to his present one, the additional courses shall be taken according to the course requirements of the new major. If the completed courses meet the requirements of the new major, they can be included in the credit points of the degree courses.

4. 硕士研究生选修本专业培养方案以外的研究生课程，经导师签字同意，可以算作本专业的专业选修课。

4. For master students, with the approval of their supervisors, courses that do not belong to this program could be included in specialized elective courses for their major.

4. 硕士研究生补修本专业培养方案以外的本科生课程，所获学分不计入学位课程学分。

5.Credit points obtained by master students in supplementary undergraduate courses will not be counted as credit points for degree courses.

5. 研究生所选课程需经过导师同意。

6.Courses chosen by postgraduates must be approved by the supervisor.

7. 本专业课程设置列表如下：备注中标注①②③④的课程为对应

①物理电子学、②电路与系统、③微电子学与固体电子学、④电磁场与微波技术四个二级学科推荐专业基础课程。

7.The course list of this major is as follows: The courses marked ①②③④ in the remarks are recommended as specialized basic courses of the four second-level disciplines ① Physical electronics, ② Circuits and Systems, ③ Microelectronics and Solid-state Electronics, and ④ Electromagnetic field and Microwave Technology.

课程类 Course types	课程编号 Code	课程名称 Name	学时 Class hour	学分 Credit point	备注 Note
硕士学科基础课程 Basic courses for master students	ELEC6101P	物理电子学导论 Introduction to Physical Electronics	80	4	
	ELEC6102P	高等核电子学 Advanced Nuclear Electronics	80	4	
	ELEC6103P	近代信息处理 Modern Information Processing	80	4	
	PHYS6051P	近代物理进展 Modern Physics Seminar	80	4	
	CONT6101P	矩阵代数 Matrix Algebra	60	3	
	INFO6101P	矩阵分析与应用 Matrix Analysis and Applications	60	3	
	CONT6102P	实变与泛函 Real variable Function and Function Analysis	80	4	
	CONT6104P	组合数学 Combinatorial Mathematics	60	3	

硕士专业基础课程 Specialized basic courses for master students	ELEC5303P	超大规模集成电路工艺学 VLSI Process	60	3	③本硕 Undergraduate and postgraduates
	ELEC5304P	半导体器件原理 Theory of Semiconductor Devices	60	3	③本硕 Undergraduate and postgraduates
	PHYS6251P	高等固体物理 Advanced Solid State Physics	100	5	
	ELEC5301P	核电子学方法 Method of Nuclear Electronics	80	4	① 本硕 Undergraduate and postgraduates
	ELEC6201P	可编程逻辑器件原理及应用 Principle and Application of Programmable Logic Device	60	3	①
	ELEC6202P	物理电子学逻辑设计与仿真实验 Physical Electronics Logic Design and Simulation	40	2	①
	ELEC6203P	高速数字系统设计 High Speed Digital System Design	80	4	①
	ELEC5302P	快电子学 Fast Electronics	60	3	① 本硕 Undergraduate and postgraduates
	ELEC6204P	硬件描述语言程序设计与实践 Hardware Description Language Design and Practice	60	3	①
	ELEC6215P	数字系统架构 Digital System Architecture	40	2	②
	ELEC6205P	CMOS 模拟集成电路设计 Design of CMOS	60	3	②

		Analog Integrated Circuits			
	ELEC6206P	数字系统设计自动化 VLSI Design Automation	60	3	②
	ELEC6207P	集成电路工艺与设计实践 Practice of Integrated circuits Technologies	60	3	②
	ELEC6208P	数字信号处理 II Digital Signal Processing (II)	60	3	②
	CONT6205P	模式识别 Pattern Recognition	60/20	3.5	②
	ELEC6209P	数字图像分析 Digital Image Analysis	60/20	3.5	②
	ELEC6210P	超大规模集成系统设计 Design of Very Large Scale Integrated System	60	3	③
	ELEC6211P	模拟集成电路原理与设计 Principles and Design of Analog IC	60	3	③
	ELEC6212P	高等电磁场理论 Advanced Electromagnetic Field Theory	60	3	④
	ELEC6213P	微波网络理论及应用 Microwave Network Theory and Its Applications	60	3	④
	ELEC6214P	计算电磁学 Computational Electromagnetics	60/20	3.5	④
硕士专业选修课程 Specialized elective courses for master students	PHYS6252P	固体物理实验方法 (I) Experimental Method in Solid State Physics (I)	80	4	
	PHYS5051P	粒子探测技术 Particle Detection	80	4	

		Technology			
	PHYS6151P	高等电动力学 Advanced Electrodynamics	80	4	
	INFO6207P	信号检测与估计 Signal Detection and Estimation	60	3	
	INFO6405P	智能信息处理导论 Introduction to Intelligent Information Processing	40/20	2.5	
	ELEC6401P	数据采集与处理技术 Data Acquisition and Processing Technology	60	3	
	ELEC6402P	嵌入式系统原理及 应用 Theory and Application of Embedded Systems	60/40	4	
	ELEC6403P	射频集成电路设计 Design of RF Integrated Circuit	60/20	3	
	ELEC6404P	先进模拟集成电路 设计技术 Advanced analog integrated circuit design technology	60/20	3.5	
	ELEC6405P	现代电子系统设计 Advanced Analog Integrated Circuits Design	60	3	
	ELEC6406P	随机过程与随机信 号处理 Random process and random signal processing	60	3	
	ELEC6407P	GPU 并行计算 GPU Parallel Computing	30/40	2.5	
	ELEC6408P	FPGA 系统设计 FPGA system design	40/20	2.5	

ELEC6409P	半导体先进制造技术 Advanced semiconductor manufacturing technology	40	2	
ELEC6410P	先进存储技术 Advanced Storage Technologies	40	2	
ELEC6411P	集成电路前沿讲座 I Seminars on Advancement of Integrated Circuits (I)	20	1	
ELEC6412P	集成电路前沿讲座 II Seminars on Advancement of Integrated Circuits (II)	20	1	
ELEC6413P	先进电子线路 Advanced Electronic Circuits	80	4	
ELEC6414P	神经网络及其应用 Neural Networks and Its Applications	60	3	
ELEC6415P	微波电路原理与设计 Principle and Design of Microwave Circuit	60	3	
ELEC6416P	现代通信光电子学 Optical Electronics in Modern Communications	40/20	2.5	
ELEC6417P	光波导技术基础 Fundamentals of Optical Waveguide Technology	40	2	
ELEC6418P	毫米波通信技术 Millimeter Wave Communication Technology	40	2	
ELEC6419P	现代微波测量 Advanced Microwave	40	2	

		Measurement			
	ELEC6420P	信号完整性分析 Signal Integrity Analysis	60	3	
	ELEC6421P	耦合模理论 Coupled-mode Theory	40	2	
	ELEC6422P	介质导波结构及应用 Dielectric Guiding Structure and its Applications	60/20	3.5	
	PHYS5001P	高等量子力学 Advanced Quantum Mechanics	80	4	
	ELEC6423P	现代天线技术 Advanced Antenna Technology	40	2	
	ELEC6424P	机器学习 Machine Learning	60	3	
博士专业课程 Specialized courses for doctoral students	ELEC7401P	物理电子学应用技术专题 The Special Topic of Applied Technology of Physical Electronics	80	4	①
	ELEC7402P	物理电子学前沿技术 The Frontier Technology of Physical Electronics	80	4	①
	ELEC7403P	电路与系统专题 The Frontier Technology of Physical Electronics	40	2	②
	CONT7101P	信息科学的数学理论 Mathematics Theory of Information Science	40	2	③ ④
	ELEC7404P	智能信息系统 Intelligent Information System	40	2	②
	ELEC7405P	先进电子器件的射频建模兼芯片验证 Advanced RF	40	2	②

		Device Modelling cum IC Validation			
	ELEC7406P	功率集成电路设计 Power Integrated Circuits Design	40	2	②
	ELEC7407P	微机电系统及其应 用 MEMS System and Its Application	40	2	②
	ELEC7408P	处理器架构 Processor Architecture	40	2	②
	ELEC7409P	微电子学前沿技术 The Frontier Technology of Microelectronics	80	4	③
	ELEC7411P	电磁场与微波技术 专题 Selected Topics on Electromagnetics and Microwave	40	2	④

附件

Appendix

留学生公共必修课类型及学分要求

Types and credit requirements of public compulsory courses for international students

2018年秋季学期及之前入学的攻读硕士和博士学位的留学研究生的公共必修课为汉语和中国概况课程，其中CAS-WAS奖学金（包括CAS-WAS “一带一路” 奖学金）：《综合汉语》4学分；《汉语听说》2学分；《中国概况》4学分，共10学分，每门75分及格。其他奖学金（包括CSC奖学金、USTC奖学金）：《基础汉语》2学分；《中国概况》4学分，共6学分，每门75分及格。

Chinese language and China Panorama courses are the public compulsory courses for international graduate students for master's or doctoral degrees who were enrolled in the autumn semester of 2018 and before. For the CAS-WAS scholarship recipients (including CAS-WAS "Belt and Road" scholarship recipients), the credit settings are as follows: *Comprehensive Chinese* (4 Credit Points); *Chinese Listening and Speaking* (2 Credit Points); *China Panorama* (4 Credit Points), 10 Credit Points in total, 75 or more (≥ 75) for each pass. For other scholarship recipients (including CSC scholarship recipients and USTC scholarship recipients), the credit settings are as follows: *Basic Chinese*

(2 Credit Points); *China Panorama* (4 Credit Points), 6 Credit Points in total, 75 or more (≥ 75) for each pass

2019年秋季学期及之后入学的攻读硕士和博士学位的留学研究生的公共必修课是汉语和中国概况课程，由国际学院在每年秋季学期集中开设，并负责课程管理。根据国际研究生录取时确定的专业教学语言，公共必修课设置如下：

Chinese language and China Panorama are the public compulsory courses for international graduate students studying for master's or doctoral degrees who were enrolled in the autumn semester of 2019 and after. The courses are offered and administrated by International College in the autumn semester each year. According to their major's teaching language chosen by international graduate students, the public compulsory courses settings are as follows:

1) 以中文为专业教学语言的留学研究生，公共必修课包括：

《高级汉语》，4 学分；《中国概况》，4 学分；共计 8 学分，原则上应在入学后第一学期完成。毕业时汉语水平应达到 HSK 五级，并取得相应证书。

1) For international graduate students who choose Chinese as their major's teaching language, the public compulsory courses include:

Advanced Chinese (4 Credit Points); *China Panorama* (4 Credit Points).

A total of 8 Credit Points should be obtained in the first semester after

admission in principle. Upon graduation, students should attain HSK Level-5 and obtain its certificate.

2) 以英语为专业教学语言的国际研究生，公共必修课包括：

《综合汉语》，2 学分；《汉语听说》，2 学分；《中国概况》，4 学分；共计 8 学分，原则上应在入学后第一学期完成，毕业时汉语水平应达到 HSK 三级，并取得相应证书。

2) For international graduate students who choose English as their major's teaching language, the public compulsory courses include:

Comprehensive Chinese (2 Credit Points); Chinese Listening and Speaking (2 Credit Points); China Panorama (4 Credit Points). A total of 8 Credit Points should be obtained in the first semester after admission in principle. Upon graduation, students should attain HSK Level-3 and obtain its certificate.