西安交通大學

XI'AN JIAOTONG UNIVERSITY

Graduate Program for International Students

Graduate School

2020.07

电子与信息学部

Faculty of Electronic and Information Engineering

电子信息与软件类国际研究生培养方案

International Graduate Programs in Electronic Information and Software

一、培养目标（Program objectives）

一）硕士研究生培养目标（ Masters Programs）

培养学生在电子信息与软件相关领域的知识和技能，通过课程学习和自主研究，培养学生独立从事科学研究、指导和组织课题进行研究工作的能力，使其能独立承担对学科发展或国民经济建设有意义的研究，能胜任研究机构、高等院校和产业部门有关方面的教学、研究、开发与管理工作。

The Masters programs aim to help the students to gain knowledge and skills in selected fields of Electronic Information and Software, including Electronic Science and Technology, Information and Telecommunication Engineering, Automation Science and Technology, and Computer Science and Technology. Students will develop their analyzing, designing and experimental abilities through course studies and independent research for a successful career as professional engineer or pursuing higher academic degree program.

二）博士研究生培养目标（Doctoral Programs）

（一） 电子科学与技术学科（Electronic Science and Technology）

1．具有坚实的数学、物理基础知识，掌握本学科坚实、宽广的基础理论，对所从事的研究方向及相关领域具有系统深入的专门知识，掌握电子科学与技术及相关一级学科中有关领域的研究发展趋势，熟练掌握相关的实验技术及计算机技术，对本学科的某一方面有深入的研究并有独创性的研究成果。

After training in the programs, PhD candidates will have a solid foundation in mathematics and physics, master solidly and broadly basic theories of the electronic science and technology, have systematic and in-depth knowledge in electronic science and technology research areas and related fields, understand the research trends in electronic science and technology, master skillfully the related experimental and computer technologies, and achieve original research results in an area of the discipline through the in-depth studies.

2．具有独立从事科学研究、指导和组织课题进行研究工作及科技开发工作的能力，以及严谨求实的科学态度和工作作风；具有成为该学科学术带头人的素质。能独立承担对学科发展或国民经济建设有意义的研究或开发课题，能胜任研究机构、高等院校和产业部门有关方面的教学、研究、开发、工程技术或管理工作。

After training in the programs, PhD candidates will be able to independently conduct scientific

research, organize and lead related scientific and technological research projects based on rigorous and scientific attitudes, be qualified to become an candidate of leader in electronic science and technology research field, be qualified for the teaching, research, development, engineering or management positions in research institutes, universities and related industries.

3．至少熟练掌握一门外国语，可选修第二外国语。能熟练地阅读本专业的外文资料，具有一定的写作能力和进行国际学术交流的能力。

After training in the programs, PhD candidates will be proficient in one foreign language, and have some skills in a second foreign language, and be able to read the foreign literature of the discipline studied, and to write and communicate academically in a foreign language.

（二） 信息与通信工程学科（Information and Communication Engineering）

本学科培养德、智、体、美全面发展的信息与通信工程领域的科学研究人才、工程技术专门人才和高等学校师资力量。具体要求要求如下：

This program aims at student developments all-roundly in morality, intellectuality, fitness, and aesthetics of the students via well balanced knowledge structure, and competence-oriented and innovation-cultivating education so as to cultivate them to become researchers, engineering specialists and university teachers in the field of information and communication engineering. The detailed objectives are as follows:

1．在信号与信息处理，通信与信息系统方面掌握坚实宽广的基础理论和系统深入的专门知识和必要的实验技能，熟悉所从事研究方向的科学技术发展动向。

Having solid foundation, systematic and detailed knowledge, and experimental skills in Information and Communication Engineering, and being knowledgeable of the development trends of the technologies in their research areas;

2．具有独立从事本学科领域内科学研究、专门技术工作和教学工作能力。具有实事求是，严谨的科学作风。能胜任研究机构、高等院校和产业部门有关方面的教学、研究、开发、工程技术或管理工作。

Being able to conduct research, technical skills work, and teaching work independently; have developed a rigorous and down-to-earth work style; being qualified for jobs of teaching, research and deployment, as well as other positions in engineering technology or management.

3．掌握至少一门外国语，并能熟练地进行专业文献阅读和论文撰写。

Being proficient in one foreign language and being able to read foreign literature and to write scientific papers in the foreign language.

（三） 控制科学与工程学科(Control Science and Engineering)

本学科培养德、智、体全面发展，且知识结构合理、综合素质高和创新能力强的高级专门人才。取得本学科工学博士学位的毕业生，将能在控制科学与工程及相关学科领域的科学研究、大学教学、技术开发及工程管理等方面发挥带头人的作用。具体要求如下：

This program aims at all-round development of students in morality, intellectuality, fitness, and aesthetics via well balanced knowledge structure, and comprehensive competence-oriented and innovation-cultivating education so as to foster talents that can play a leading role as researchers, university teachers, technology developer and engineering mangers in Control Science and Engineering.

The detailed objectives are as follows:

1．掌握坚实宽广的基础理论和系统深入的专业知识，在独立从事科学研究、技术开发、组织科学研究和从事教学等方面具有很强的能力；能把握本学科一些新的研究方向，熟悉所从事研究的最新科技发展动态；至少熟练掌握一门外语，能熟练阅读和翻译专业文献，能用外语进行交流和撰写科技论文。

Having solid foundation, systematic and in-depth knowledge, and experimental skills in Control Science and Engineering; being familiar with the trends of the technologies in their research areas.; being proficient in at least one foreign language; be able to read and translate foreign literature and to write scientific papers and communicate in a foreign language.

2．具有实事求是、科学严谨的工作作风以及协作、奉献、勇于创新的精神，在实际工作中勇于承担责任，勇于解决科学技术难题。

Having developed a down-to-earth and scientific and rigorous work style while demonstrating wiliness in collaboration, sacrifice and having the courage to innovate, and shoulder responsibilities, solving technical difficulties;.

3．在本领域内取得创造性成果。

Be able to accomplish innovative achievements s in the field of Control Science and Engineering.

（四） 计算机科学与技术学科(Computer science and Technology)

1．具有良好的数学基础知识，掌握本学科坚实、宽广的基础理论，对所从事的研究方向及相关领域具有系统深入的专门知识，掌握计算机科学与技术及相关一级学科中有关领域的研究发展趋势，熟练掌握相关的计算和实验技术，对本学科的某一方面有深入的研究并有独创性的研究成果。

After training in this program, the PhD candidates will have a sound basis in mathematics, mastery of solid and broad foundation of basic theories, have systematic and in-depth specialized knowledge in the research area undertaken and the related fields, understanding the developmental trends of the computer science and technology and the related first level disciplines, skillful mastery of the related computer and experimental technologies, and have in-depth research in an area of the discipline undertaken, and have produced original research outcomes.

2．具有独立从事科学研究、指导和组织课题进行研究工作及科技开发工作的能力，以及严谨求实的科学态度和工作作风；具有成为该学科学术带头人的素质。能独立承担对学科发展或国民经济建设有意义的研究或开发课题，能胜任研究机构、高等院校和产业部门有关方面的教学、研究、开发、工程技术或管理工作。

After training in the programs, The PhD candidates will be able to independently conduct scientific research, organize and lead related scientific and technological research projects based on rigorous and scientific attitudes, be qualified to become an candidate of leader in computer science and technology research field, be qualified for the teaching, research, development, engineering or management positions in research institutes, universities and related industries.

3．熟练掌握一门外国语，可选修第二外国语。能熟练地阅读本专业的外文资料，具有一定的写作能力和进行国际学术交流的能力。

Graduates will be proficient in the first foreign language, and have some skills in a second foreign

language. Graduates will be able to read the literature of the discipline undertaken in a foreign language be able to write and communicate in international academic setting.

4．具有良好的职业道德素养，心理健康，身体健康。

Graduates will be well-fostered in ethics and morality, psychological health and physical health.

（五） 网络空间安全学科(Cyberspace Security)

当前的网络空间已经扩展为物理（网络）设备空间、网络链路与应用空间、现实社会空间、虚拟社会空间等组成的多样空间。区别于只注重计算机网络为主的网络安全研究，网络空间安全主要围绕网络空间中基础设施、信息系统、网络、运行数据与内容、软件系统与应用中所存在的安全问题，本学科方向借助计算机、自动化、通信和数学等学科交叉的优势，开展理论、方法、技术、系统、应用、管理和法制等方面的研究。为适应网络空间安全的需要，本专业具体要求如下：

Cyber space has expanded into a variety of spaces consisting of physical space & cyber space, and real social space & virtual social space. Different from the network security, cyberspace security mainly focuses on the security problems in infrastructure, information systems, networks, operational data and content, software systems and applications in cyberspace. In order to meet the demand of cyberspace security, the specific requirements of this major are as follows:

1．熟练掌握坚实的网络空间安全的基础理论和系统的专门知识，深入了解学科的发展现状、趋势和研究前沿；较熟练地掌握一门外国语，具有良好的写作能力和进行国际学术交流能力；具有独立从事本学科和相关学科领域的科学研究的能力，能够熟练运用网络空间安全学科的方法、技术与工具，能够胜任网络空间安全领域的基础研究、应用研究、关键技术及系统相关方面的教学、研究、开发、工程技术或管理工作。

Graduates will be well-informed solidly in the basic theory and systematic specialized knowledge e of cyberspace security, gain a deep understanding of the development status, trends and research frontiers of the discipline. And also graduates will be proficient in a foreign language with good writing skills and international academic communication skills, have the ability to independently conduct scientific research in the discipline undertaken and the related disciplines, be skillful in the application of the methods, techniques and tools of the cyberspace security discipline, be qualified for the job positions of basic research, applied research, key technologies and system related areas in teaching, research, development, engineering or management.in the field of cyberspace security.

2．具有实事求是、科学严谨的工作作风及协作、奉献、勇于探索的精神，在实际工作中勇于承担责任，勇于解决科学技术难题。

Graduates will have the working style of seeking truth from facts, scientific and rigorous work style, collaboration, dedication, and courage to explore. They must take responsibility in practical work and strive to solve scientific and technological problems.

二、研究方向 (Research fields)

I．**硕士研究生研究方向**（Research fields for Masters Students）

电子科学与技术、信息与通信工程、计算机科学与技术、控制科学与工程与网络空间安全五

个一级学科研究方向。

There are five research fields, including: Electronics Science and Technology, Information and Communication Engineering, Control Science and Engineering, Computer Science and Technology, Cyberspace Security

II．博士研究生研究生方向（Research fields for Doctoral Students）

（一） 电子科学与技术学科 Electronics Science and Technology

1．物理电子学(Physical Electronics)

带电粒子光学现代理论和计算技术，微纳米器件电子束离子束加工与检测技术，强流电子束物理和高功率微波技术，气体放电与等离子体电子学，信息显示器件与技术，纳光子学基础理论和实验技术，新型光子材料与器件，非线性光学，超快光子技术，固态照明器件、真空微电子技术。

Fundamentals of Quantum Information Technology and Ultrafast Photonics, Nonlinear Optics; Fundamental Theory and Experimental Techniques of Nano Photonics; Novel Photonic Materials and Devices; Photoelectric Imaging and Image Processing; Modern Theory and Computational Techniques of Charged Particle Optics; Electron Beam Ionization of Micro-Nano Devices Beam Processing and Inspection Technology; Microwave and Terahertz Electronics, Discharge and Plasma Electronics; Information Display Devices and Technology, Solid State Lighting Devices; Vacuum Microelectronics Technologies, Wide Band-gap Semiconductor Materials and Devices.

2．电路与系统(Circuits and Systems)

VLSI 电路与系统设计，电路与系统 CAD 及设计自动化，数字图象与数字视频处理，功率电子学，非线性电路与系统，信息显示系统设计与实现。

VLSI Circuit and System Design; Circuit and System CAD and Design Automation; Digital Image and Digital Video Processing; Power Electronics; Nonlinear Circuits and Systems; Information Display System Design and Implementation.

3．微电子学与固体电子学(Microelectronics and Solid State Electronics)

深亚微米器件模型与仿真，微波功率器件及其集成，化合物半导体器件；深亚微米工艺集成；片上系统、超大规模集成电路及 ASIC 设计与测试；微电子机械系统设计与制造；纳米电子材料与器件，电子陶瓷材料与器件，铁电单晶材料，铁电薄膜与器件，机敏材料与器件，纳米复合功能材料与器件，电解质材料与器件。

Deep Submicron Device Model and Simulation, Microwave Power Devices and Integrations, Compound Semiconductor Devices; Deep Submicron Processing Integration; On-Chip Systems, VLSI and ASIC Design and Testing; Microelectronic Mechanical System Design and Manufacturing; Nanoelectronic Materials and Devices, Piezoelectric Single Crystal Materials and Devices, Wide Band Gap Semiconductor Single Crystal Materials, Electro-Optical Crystals, Magnetoelectric Materials and Devices, Ferroelectric Single Crystal Materials, Ferroelectric Ceramic Materials, Ferroelectric Thin Films and Devices, Spin Electron Materials and Devices , Integrated Multi-Ferroic Materials and Devices; Smart Materials and Devices, Nano-Composite Functional Materials and Devices, Electrolyte Materials and Devices.

4．电磁场与微波技术(Electromagnetic Field and Microwave Technology)

电磁场理论与技术：电磁场理论与应用，天线理论与技术，电波传播，复杂介质中的场与波，电磁散射与逆散射，环境电磁学与电磁兼容技术，计算电磁学。微波与毫米波理论与技术：微波电路，微波网络，微波集成电路，微波测量理论与技术，微波信息处理与成像。

Electromagnetic field theory and application, antenna theory and technology, wave propagation, field and wave in complex media, electromagnetic scattering and inverse scattering, environmental electromagnetics and electromagnetic compatibility technology, computational electromagnetics; microwave circuits, microwave networks, microwave integrated circuits, microwaves measurement theory and technology, microwave information processing and imaging; high power microwave transmissions.

（二） 信息与通信工程学科(Information and Communication Engineering)

1．通信与信息系统 (Communication and information system)

现代通信理论与应用，移动网络，无线传感器网络，无线网络安全，卫星通信，数据广播，无线通信系统设计，移动通信与无线接入，天线与电波传播等。

The research areas include modern communication theory and applications, mobile internet, wireless sensor network, wireless network security, satellite communications, data broadcasting, design of wireless communication system, mobile communication and wireless access，antennas and propagation, etc.

2．信号与信息处理 (Signal and information processing)

多媒体信号处理与传输，医学成像与图像处理，多天线信号处理，雷达信号处理，复杂媒质中的波传播及信号分析，语音信号分析、处理与识别，音频、视频信号数据压缩技术等。

将根据信息工程的需要，科学技术的发展增设其他研究方向。

The research areas include multimedia processing and transmission, biomedical imaging and related image processing, multi-antenna signal processing, radar signal processing, wave propagation in complex media and signal analysis, speech signal processing and recognition，data compression technology of audio and video signals，etc.

Apart from the above research areas, we can also add other research areas according to the development needs of the discipline of information and communication engineering.

（三） 控制科学与工程学科(Control Science and Engineering)

1．控制理论与控制工程(Control Theory and Control Engineering)

非线性控制系统的频率分析与综合理论、控制理论及应用、复杂系统的故障检测与诊断、随机控制与自适应控制、过程工业的综合自动化（检测、控制与管理）、多智能体理论与技术、鲁棒控制理论及应用等。

The research areas include Frequency analysis and synthesis theory of the nonlinear control system, control theory and application, fault detection and diagnosis of complex systems, stochastic control and adaptive control, Integrated automation of process industry (detection, control and management), multi-agent theory and technologies, robust control theory and application, etc.

2．检测技术与自动化装置 (Detection Technologies and Automatic Equipment)

智能检测与智能信息处理、虚拟仪器与软测量技术、嵌入式系统与智能仪器仪表、无接触图

像测量与模式识别、现场总线技术及应用、基于 Internet 远程测控技术、智能控制理论及其应用、智能交通系统、过程控制与应用、机器人控制与数控技术、图像信息融合。

The research areas include intelligent detection and intelligent information processing, virtual instruments and soft measuring techniques, embedded system and intelligent instrument, contactless image measurement and pattern recognition, field-bus technologies and application, internet-based remote measurement and control technology, intelligent control theory and applications, intelligent transportation systems, process control and applications, robot control and digital control techniques, image information fusion, etc.

3．系统工程 (System Engineering)

复杂系统智能控制的理论与方法、复杂网络化系统优化理论与应用（电力系统、制造系统等）、网络安全理论与技术、离散事件动态系统控制与调度方法、智能电网、智能机器人与多智能体系统、计算社会学、大数据建模与分析、机器学习与智能计算、先进制造中的关键系统集成理论与技术等。

The research areas include theory and methods of intelligent control for complex systems, optimization theory and applications of complex networked system (power system, manufacturing system, etc.), network security theory and technologies, control and scheduling methods for discrete-event dynamic system, smart grid, intelligent robot and multi-agent system, computational sociology, big data modeling and analysis, machine learning and intelligent computing, and integration theory and technologies for key-systems in advanced manufacturing, etc.

4．模式识别与智能系统 (Pattern Recognition and Intelligent Systems)

模式识别与计算机视觉、机器学习与智能系统、计算机视觉与数字视频专用 VLSI 设计、网络媒体计算与可视化技术、计算视频与可伸缩编码、自适应信号处理、空间机器人视觉系统与太空信息工程等。

The research areas include pattern recognition and computer vision, machine learning and intelligent systems, computer vision and VLSI design application-specific digital video, network media computing and visualization technologies, computing video and scalable video coding, adaptive signal processing, vision system of space robot and space information engineering, etc.

5．导航制导与控制(Navigation, Guidance and Control)

多源信息融合理论与应、信息融合与目标信息处理、不确定性推理与推断、导航、定位与测控技术、飞行器控制与仿真等。

根据学科发展需要，将增加或修订研究方向。

The research areas include theory and applications of multi-source information fusion, information fusion and target information processing, uncertainty reasoning and inference, navigation, positioning and measurement and control technologies, aircraft control and simulation, etc.

According to the development of the discipline of control science and engineering, the research areas can be expanded or revised.

（四） 计算机科学与技术学科(Computer Science and Technology)

1．高性能计算(High-performance Computing)

并行计算理论与技术，高性能计算机体系结构，分布式存储系统，云计算与大数据技术，虚

拟化技术，并行计算机系统与自动并行化技术。

The areas of research include the following: Parallel computing theory and technology; high-performance computer architecture; distributed storage systems; cloud computing and big data technology; virtualization technology; parallel computer systems and automatic parallelization technology.

2．多模态碎片化知识分析、挖掘与融合 (Multi-model fragmentation knowledge analysis, mining and fusion)

大数据算法与分析技术，碎片化知识挖掘与融合，智能网络学习环境理论及技术。

The areas of research include the following: Big data algorithm and analysis technology; fragmentation knowledge mining and fusion; intelligent network learning environment theory and technology.

3．分布式系统与普适计算 (Distributed Systems and Pervasive Computing)

分布式计算与系统，操作系统与虚拟化技术，大数据系统与云计算，区块链技术与应用，云安全与数据隐私保护，普适计算与智能感知，物联网与边缘计算等。

The areas of research include the following: Distributed computing and systems, operating systems and virtualization technology; big data systems and cloud computing; blockchain technology and applications; cloud security and data privacy protection; pervasive computing and intelliSense; internet of things and edge computing.

4．智能计算与大数据技术(Intelligent Computing and Big Data Technology)

机器学习与数据挖掘，软件工程数据挖掘，网络数据挖掘，计算智能与挖掘技术，海量数据管理，数据安全，大数据计算技术，计算生物学，生物信息处理，医疗健康大数据工程技术。

Areas of research include machine learning and data mining; data mining of software engineering; network data mining, computing intelligence and mining technology; massive data management; data security; big data computing technology; computational biology; biological information processing; the technology of big data in Healthcare.

5．网络安全与可信计算 (Network Security and Trusted Computing)

密码学，隐私保护，可信计算，物联网与云计算，大数据与人工智能，广义人机交互。

根据学科发展需要，将增加或修订研究方向。

Areas of research include cryptography; privacy protection; trusted computing; internet of things and cloud computing; big data and artificial intelligence; broad human-computer interaction.

The research areas can be expanded or revised according to the development needs of the discipline.

（五） 网络空间安全学科 (Cyberspace Security)

本学科的研究方向有如下方面：

网络空间安全学科有 4 个学科方向：网络空间安全基础、网络空间大数据处理与内容安全、信息物理融合系统（CPS）安全和软件系统安全。

The cyberspace security discipline has four areas of research: Cyberspace infrastructure security, cyberspace big data processing and content security, cyber-physical systems (CPS) security, and

software system security.

1．网络空间基础设施安全 (Cyberspace Infrastructure Security)

本学科方向以网络流量为基本载体，建立“内外兼顾、监控与预测并举、入侵检测和主动防卫相结合”的多粒度网络安全防卫体系和整体解决方案，解决无线通信安全、无线传输安全、电磁空间安全、攻击源快速解析定位、不获取流量数据估计僵尸网络在全球分布及危害规模等难题，提升整体系统安全监控能力。

Our research in this area is to build a multi-granularity defense system for network security, based on network traffic analysis. This defense system can realize the monitoring and predicting simultaneously with both intrusion detection technology and active defense technology. Meanwhile, we will put forward an integrated solution to the problems in wireless communication and transmission security, electromagnetic space security, fast analytical and location technique of attack source, global distribution estimation and damage scale prediction of Botnet, etc. And that will promote the monitoring capacity for security of the whole system.

2．网络空间大数据处理与内容安全(Cyberspace Big Data Processing and Content Security)

本学科方向瞄准国家在网络内容安全的重大需求，以海量舆情及色情、暴力等不良网络内容为对象，以针对海量、非结构化、高复杂性网络大数据设计的机器学习与数据挖掘模型与算法为支撑，瞄准理论与关键技术的重大创新需求，包括智能化网络话题的发现、跟踪及动态传播特性分析、多源舆情数据获取、话题动态传播趋势预测等，为网络有害信息传播的监控提供可靠的技术解决方案，并在军事、教育、环保等行业进行产品化推广应用。同时，内容安全延伸问题的研究也将有效推动针对高复杂性数据的新型机器学习与数据挖掘基础技术的发展。

The area of this research is to deal with Internet content security, using machine learning and data mining models and algorithms as basis for dealing with massive, unstructured, and highly complex network big data, with huge amounts of public opinion and pornography, violence and other bad network content as the research object. The goal target of our research is the major innovations in theory and key technologies, including intelligent network topic discovery, tracking and dynamic propagation characteristics analysis, multi-source public opinion data acquisition, topic dynamic propagation trend prediction, etc. For this, our research results will provide the reliable technical solutions for monitoring the harmful information dissemination of the network and product promotion and application in military, education and environmental protection industry. At the same time, the research on content security extension will also effectively promote the development of new machine learning and data mining basic technologies for high complexity data.

3．信息物理融合系统（CPS）安全 (Cyber-Physical Systems (CPS) Security)

物理系统与信息网络高度融合的新型系统称为信息物理融合系统（Cyber-Physical Systems, CPS），是孕育中的第四次工业革命的基础。CPS 由于信息和物理直接融合，系统结构运行机理更为复杂，安全防范的难度大为增加，同时攻击危害将远超过传统信息攻击，CPS 安全保护方法已成为国家重大战略需求。CPS 安全研究具有明显的学科交叉特性，本学科方向借助计算机、自动化、通信与数学等学科交叉的优势，瞄准国家在工业控制系统、基础设施信息化过程中面临的安全威胁，物理系统安全可靠技术和信息网络安全隐私技术，开展理论与关键技术研究，包括 CPS

综合安全模型、信息与物理数据异常融合分析、控制认证、数据云存储与计算安全、无线通信系统安全以及在智能电网、物联网等领域的安全应用。

The new system, in which the physical system and the information network are highly integrated, is called the Cyber-Physical Systems (CPS), which is the basis of the fourth industrial revolution. In cyber-physical systems, due to the direct integration of information and physics, the operating mechanism of the system structure is more complicated, and the difficulty of security protection is greatly increased. At the same time, the attack damage will far exceed the traditional information attack. The CPS security protection method has become a major strategic requirement of the country. CPS security research has obvious interdisciplinary characteristics. The direction of this discipline is based on the advantages of interdisciplinary integration of computer, automation, communication and mathematics, and aimed at security threats faced by the state in the process of industrial control system and infrastructure information, physical system security and reliability technology and information network security privacy technology to carry out theoretical and key technology research, which includes the CPS comprehensive security model, abnormal fusion analysis of information and physical data, control certification, data cloud storage and computing security, wireless communication system security and security applications in the field of smart grid and the internet of things.

4．软件系统安全(Software System Security)

本学科方向以软件系统安全分析、保障与提升为切入点，从可信性度量与评测，软件行为与用户行为建模，软件依赖关系建模与测试三方面进行了深入研究，解决了一系列关键科学问题，有效提升软件系统的安全性及可靠性。

根据学科发展需要，将增加或修订研究方向。

The area of this research is based on software system security analysis, guarantee and promotion as the breakthrough point. It has carried out in-depth research on credibility measurement and evaluation, software behavior and user behavior modeling, software dependency modeling and test three aspects to solve a series of problems, which effectively improves the security and reliability of the software system.

The research areas can be expanded or revised according to the development needs of the discipline.

三、学习年限（Length of programs）

I．**硕士研究生学习年限**（Length of programs for Masters Students）

国际硕士研究生学习年限一般为 2-3 年，经批准可适当延长，延长时间不超过 1 年。

The length of Masters Programs is 2 to 3 years; Prolongation (no more than one year) has to be approved by the university.

II．**博士研究生学习年限**（Length of programs for Doctoral Students）

国际博士研究生学习年限一般为 3-5 年，经批准可适当延长，延长时间不超过 1 年。

The length of doctoral programs is 3 to 5 years. Prolongation (no more than one year) has to be approved by the university.

四、培养方式(Program overview)

I．硕士研究生培养方式（Master's Program overview）

研究生培养实行导师负责制，导师根据研究生具体情况，统筹考虑专业基础理论的学习和课题研究工作，在第一学期开始时帮助学生制定培养计划。首先，学生需学习包括中国文化和基础课程在内的各种学科；其次，为学生提供广泛的专业课程和优越的实验条件，使其能了解和学习相关领域的最新知识，培养其独立从事科学研究的能力；第三，学生在第二年进入研究小组，在相应导师的安排和指导下开展研究工作；最后，学生完成论文并申请硕士学位。

Each student will be supervised by a faculty member, who helps to make an education plan for the individual student at the beginning of first semester according to his or her research interest. Firstly, a variety of courses are available, including Chinese culture and fundamental courses; secondly, more specialized courses and laboratory units are introduced for the students to learn the up-to-date knowledge in the interested fields and useful techniques for the further research work. Thirdly, each student joins in a research group in the second year and carries out research work under the supervision of the supervisor. In the end, the student completes his or her thesis and applies for a Master's degree.

II．博士研究生培养方式（Doctoral Program overview ）

1．导师应根据本培养方案的要求与因材施教的原则，从各个博士生具体情况出发，在博士生入学三周内制定出博士生的培养计划。

Tutors should follow the instructions of this document and make an individual study plan for the respective doctoral students within three weeks of their first semester.

2．整个培养过程应贯彻理论联系实际的方针，使博士生掌握本学科的基础理论和专门知识，掌握科学研究的基本方法，并有一定的实验技能。

The education should involve both theoretical and practical learning. The doctoral students should master fundamental theories, specialized knowledge as well as basic methods of scientific research, and have certain experimental skills.

3．在指导上采取导师负责与系所集体培养相结合的方法。

Tutors take the responsibility in training the doctoral students. At the same time, other research staff in the same research group can co-supervise the doctoral students.

4．博士生学习应该强调以自学为主，教师的作用在于启发他的深入思考和正确判断，要培养博士生的独立分析和解决问题的能力。

The doctoral students should be able to learn by themselves. The role of the tutor is to enlighten and train the students so that they can eventually analyze and solve problems.

5．在完成学位课程学习和大量阅读具体研究方向上的国内外学术论文并进行初步研究探索之后，博士生应当在入学后最迟两年之内进行学位论文选题报告。

After finishing courses and intensive literature survey of certain research area followed by preliminary research, the doctoral students should make dissertation proposal within two years of their first semester.

6．博士生应当积极参加校内外的学术报告会、讲座会及其他学术活动。

The doctoral students should actively participate in scientific conferences, seminars, and other forms of academic activities.

7．博士生培养实行中期考核。第四学期由系里组织一次中期考核，考核通过者继续攻博；不

通过者，可以参加下学期的中期考核。

The PhD program has a mid-term assessment. The department will organize the mid-term assessment in the fourth semester. Students who pass the assessment can continue studying; whereas those who fail it may re-take it next semester.

五、课程学习及必修环节 (Curriculum and Compulsory Activities)

I. 硕士研究生课程学习及必修环节（Curriculum and Compulsory activities for Masters Students）

理工类学术学位硕士生的课程学习应至少取得 24 学分，包括：公共课（汉语（Ⅰ）2 学分、中国概况（Ⅰ）2 学分）4 学分、专业学位课至少 8 学分，选修课至少 12 学分,课程设置与学分详见国际硕士研究生课程设置与学分要求表格。新港报告纳入国际留学生选修课，学生听够 20 场讲座后可记 2 学分。

The Master's programs must be well balanced, emphasizing one or more theoretical or experimental aspects of Categories of Electronic Information and Software. At least 24 credits are required to get a Master's degree. Required courses include *Comprehensive Chinese I* (2 credits), *Outline of China I* (2 credits), degree courses (no less than 8 credits), and elective courses (no less than 12 credits). The detailed credit requirements for each modules and thesis work are shown in the following table. Innovation Harbour Lectures are included in elective courses for international students, 2 credits will be granted after attending 20 Lectures.

国际硕士研究生课程设置与学分要求

Curriculum Design and Credit Requirements of Masters Programs

课程类别 Course Type	**序号** No.	**课程编号** Course Number	**课程编码** Course Code	**课程名称** Course Name	**学分** Credit	**备注** Notes
公共学位课 Public Course	1	272003	LITE610112	中国概况（Overview of China）	2	必修 4 credits required
	2	272004	LITE610227	综合汉语（Comprehensive Chinese）	2	
专业学位课 Degree Course	1	052004	INFT610105	数字图像处理（Digital Image Processing）	3	选修至少 8 学分 A minimum of 8 credits required
	2	052067	EELC611205	材料结构与性能关系（Structure-property Relations of Materials）	2	
	3	052098	AUTO610905	系统优化与调度（System Optimization and Scheduling）	2	
	4	052099	AUTO611005	现代测控技术与系统 (Modern Measuring Control	2	

课程类别 Course Type	序号 No.	课程编号 Course Number	课程编码 Course Code	课程名称 Course Name	学分 Credit	备注 Notes
				Technology and Systems）		
	5	052120	AUTO711205	估计与滤波（Estimation and Filtering）	3	
	6	052172	EELC713105	照明和显示芯片技术 (Chip technology for lighting and display)	2	
	7	052177	EELC713605	高分辨电子显微学（Introduction to Electron Microscopy）	2	
	8	052187	COMP611205	无线网路与移动计算技术 (Wireless Network and Mobile Computing）	2	
	9	052190	EELC611905	电子薄膜材料及应用（Electronic thin films and applications）	2	
	10	052191	EELC612005	电子材料与器件原理（Principles of Electronic Materials and Devices）	2	
	11	052216	EELC612105	CMOS 系统电源管理（Power Management in CMOS System）	2	
	12	052194	EELC612205	半导体器件物理（Physics of Semiconductor Devices）	2	
	13	052198	INFT610805	优化理论及其在信号处理和通信中的应用（Optimization theory and its applications in signal processing and communications）	2	
	14	052199	INFT711805	现代通信技术（Advanced Communication Technology）	2	
	15	052202	AUTO712305	计算认知科学与工程（Computational Cognitive	2	

课程类别 Course Type	序号 No.	课程编号 Course Number	课程编码 Course Code	课程名称 Course Name	学分 Credit	备注 Notes
				Science and Engineering）		
	16	052203	INFT711905	数字通信原理（Principle of Digital Communication）	2	
	17	052204	AUTO712405	大数据与深度学习（Big Data and Deep Learning）	2	
	18	052207	EELC714605	生物光子学导论（Introduction to Biophotonics）	2	
	19	053174	INFT712305	多天线技术及其应用（Multi-Antenna Techniques and Their Applications	2	
	20	052209	EELC714305	柔性电子学（Flexible Electronics）	2	
	21	052212	COMP712205	生物信息计算与系统（Bioinformatics: Computational Systems and Digital Health）	2	
	22	051013	EELC714405	微纳光学（Micro and Nano-optics）	2	
	23	052176	EELC713505	光电技术导论（Introduction to Optoelectronic Technology）	2	
	24	052117	EELC711305	有机光电子学（Organic Optoelectronics）	2	
	25	053193	INFT740105	稀疏信号处理及其应用（Sparse Signal Processing and its Applications）	**2**	
	26	053194	INFT740205	统计信号处理:基础理论与机器学习方法（Statistical Signal Processing：Fundamentals and Machine Learning Perspectives）	**2**	

课程类别 Course Type	序号 No.	课程编号 Course Number	课程编码 Course Code	课程名称 Course Name	学分 Credit	备注 Notes
	27	053191	AUTO740105	信息物理融合系统安全关键技术（Security in Cyber-Physical Systems）	**2**	
	28	053190	COMP740105	基于深度学习的自然语言处理（Natural language processing with deep learning）	**2**	
	29	053192	EELC740105	高速宽带通讯集成电路设计（High-Speed Broadband Communication Integrated Circuits Design）	**2**	
选修课 (Elective Course)	/		/	在学院研究生课程目录中选修 Select from the school's curriculum of graduate courses	≥12	选修至少 12 学分 A minimum of 12 credits required
必修环节（Compulsory Activity）	1	001997	BXHJ600399	学术活动（讲座）硕 (Lectures)(Masters)	1	必修 4 学分 4 credits required
	2	001983	BXHJ600799	中期考核（硕） (Mid-term Assessment)	3	

II．**博士研究生课程学习及必修环节**（Curriculum and Compulsory Activities for Doctoral Programs）

1．本学科博士生在校期间至少修满 22 学分。课程学习总学分为 12 学分，其中学位课不少于 8 学分，选修课可在全校范围内任选，不少于 4 学分。必修环节 10 学分，包括学术活动（讲座）2 学分、开题报告 2 学分、中期考核 6 学分。最终学术报告（预答辩）和学位论文为必修环节，应按相关要求严格规范预答辩、正式答辩程序，有序组织开展相关工作，保证学位授予质量。自 2018 年起，最终学术报告（预答辩）和学位论文环节不再计入学分。

The doctoral students should obtain at least 22 credits. The total credits are 12 credits, including 8-credit compulsory courses and 4-credit elective courses. Elective courses can be chosen from other

departments. The compulsory activities merit 10 credits, including 2-credit academic activities (e.g., lectures), 2-credit dissertation proposal, and 6-credit mid-term assessment. The final dissertation oral defense and thesis are also part of the compulsory activities. The final dissertation (and preliminary defense) should strictly follow standard procedure to ensure the quality of the PhD degree.

2．博士研究生在全校范围内选听“学术讲座”6 次，自己公开讲座 1 次，完成后记 2 学分。新港报告纳入国际留学生选修课，学生听够 20 场讲座后可记 2 学分。

The doctoral students should attend 6 academic lectures at the campus and give a public lecture by themselves. They will get 2 credits after fulfilling this requirement. Innovation Harbour Lectures are included in elective courses for international students, 2 credits will be granted after attending 20 Lectures.

3．博士生应通过大量阅读具体研究方向上的学术论文并进行初步研究探索后，在第二学期完成开题报告，通过后计 2 学分。

The doctoral students should conduct intensive literature survey in certain research area followed by preliminary study, and write dissertation proposal in the second semester. They will get 2 credits after fulfilling this requirement.

4．参加系里组织的中期考核，通过后记 6 学分。

Those who pass the mid-term assessment will get 6 credits.

5．完成最终学术报告（预答辩）1 次。

The student has to do a pre-oral defense reporting as the final academic lecture.

国际博士研究生课程设置与学分要求

Curriculum Design and Credit Requirements of Doctoral Programs

课程类别 Course Type	**序号** No.	**课程编码** Course number	**全校统一编码** Course Code	**课程名称** Course Title	**学分** Credit	**备注** Notes
公共学位课 Public Course	1	272003	LITE610112	中国概况（Outline of China）	2	必修 4 credits required
	2	272004	LITE610227	综合汉语（Comprehensive Chinese）	2	
专业学位课 Degree Course	1	052004	INFT610105	数字图像处理（Digital Image Processing）	3	选修至少 4 学分 A minimum of 4
	2	052067	EELC611205	材料结构与性能关系（Structure-property Relations of Materials）	2	
	3		AUTO610905	系统优化与调度	2	

课程类别 Course Type	序号 No.	课程编码 Course number	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes
		052098		（System Optimization and Scheduling）		credits required
	4	052099	AUTO611005	现代测控技术与系统（Modern Measuring Control Technology and Systems）	2	
	5	052120	AUTO711205	估计与滤波（Estimation and Filtering）	3	
	6	052172	EELC713105	照明和显示芯片技术（Chip technology for lighting and display）	2	
	7	052177	EELC713605	高分辨电子显微学（Introduction to Electron Microscopy）	2	
	8	052187	COMP611205	无线网路与移动计算技术（Wireless Network and Mobile Computing）	2	
	9	052190	EELC611905	电子薄膜材料及应用（Electronic thin films and applications）	2	
	10	052191	EELC612005	电子材料与器件原理（Principles of Electronic Materials and Devices）	2	
	11	052216	EELC612105	CMOS 系统电源管理（Power Management in CMOS System）	2	
	12	052194	EELC612205	半导体器件物理（Physics of Semiconductor Devices）	2	
	13		INFT610805	优化理论及其在信号处理和通	2	

课程类别 Course Type	序号 No.	课程编码 Course number	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes
		052198		信中的应用（Optimization theory and its applications in signal processing and communications）		
	14	052199	INFT711805	现代通信技术 (Advanced Communication Technology）	2	
	15	052202	AUTO712305	计算认知科学与工程（Computational Cognitive Science and Engineering）	2	
	16	052203	INFT711905	数字通信原理（Principle of Digital Communication）	2	
	17	052204	AUTO712405	大数据与深度学习（Big Data and Deep Learning）	2	
	18	052207	EELC714605	生物光子学导论（Introduction to Biophotonics）	2	
	19	053174	INFT712305	多天线技术及其应用（Multi-Antenna Techniques and Their Applications）	2	
	20	052209	EELC714305	柔性电子学（Flexible Electronics）	2	
	21	052212	COMP712205	生物信息计算与系统 (Bioinformatics: Computational Systems and Digital Health）	2	
	22	051013	EELC714405	微纳光学（Micro and Nano-optics）	2	
	23	052176	EELC713505	光电技术导论 (Introduction to Optoelectronic Technology）	2	
	24	052117	EELC711305	有机光电子学（Organic Optoelectronics）	2	
	25	053193	INFT740105	稀疏信号处理及其应用	**2**	

课程类别 Course Type	序号 No.	课程编码 Course number	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes
				（Sparse Signal Processing and its Applications）		
	26	053194	INFT740205	统计信号处理:基础理论与机器学习方法（Statistical Signal Processing：Fundamentals and Machine Learning Perspectives）	**2**	
	27	053191	AUTO740105	信息物理融合系统安全关键技术（Security in Cyber-Physical Systems）	**2**	
	28	053190	COMP740105	基于深度学习的自然语言处理（Natural language processing with deep learning）	**2**	
	29	053192	EELC740105	高速宽带通讯集成电路设计(High-Speed Broadband Communication Integrated Circuits Design）	**2**	
选修课 Elective Course	/		/	在学院研究生课程目录中选修 Select from the school's curriculum of graduate courses	≥4	选修至少 4 学分 A minimum of 4 credits required
必修环节 Compulsory Activities	1	001999	BXHJ800399	学术活动（讲座）博(Lectures)(Doctoral)	2	必修 10 学分 10 credits required
	2	001986	BXHJ800499	开题报告（博）（Dissertation proposal）	2	
	3	001994	BXHJ800199	中期考核（博）(Mid-term Assessment)	6	

五、学位论文（Dissertation）

1．硕士研究生学位论文（Masters Theses）

申请硕士学位需要满足毕业论文的要求。论文选题应源于个人或团队合作的研究项目，具有一定的技术难度，能体现所学知识的综合运用，有足够的工作量。论文研究应体现作者在具体工程应用中的新意，通过解决工程问题，使学生能够将课程学习与实践经验相结合。

A satisfactory thesis is required for applying for a Master's degree. The thesis will be based on an individual or team-working research project in which each student has a defined role and responsibility. The project leading to the thesis enables the students to combine course studies with practical experience to solve engineering problems.

2．**博士研究生学位论文**（Doctoral dissertations）

1．博士生开始论文前要进行认真的文献阅读、分析和生产实际的调研。完成选题报告，按规定填写学位论文选题报告表，并在学科内做选题报告，需取得评议通过。

Before writing the dissertation, the doctoral students should perform literature survey carefully, then complete dissertation proposal and fill in the proposal form accordingly and report the proposal to get it pass the appraisal.

2．选题应是学科前沿领域课程或对我国经济和社会发展有重要意义的课题。

Research topic should be cutting-edge in the respective research area or important to the economic and social development of the country.

3．论文由博士生在导师指导或学术群体帮助下独立完成，并根据国家学位条例实施办法的精神进行严格评审和答辩。

The doctoral students should independently write the dissertation under the supervision of their tutor and/or co-supervisors. The dissertation should undergo rigorous reviewing and defense according to the national degree granting regulations.

4．博士生学位论文根据《西安交通大学学位授予工作暂行办法》有关规定进行评审和答辩，通过答辩后计 60 学分。

The doctoral dissertation should be reviewed and orally defended according to the temporary regulation for awarding a degree at Xi'an Jiaotong University.

六、培养环节时间节点（Timeline and milestones）

	课程学习 Course Work	开题报告 Thesis proposal	中期考核 Mid-term Assessment	预答辩 Pre-oral defense reporting	论文答辩 Oral defense of Thesis/Dissertation
硕士 Master programs	第一学年 First year	第二学年 Second year	第三学期或第四学期 Third semester or forth semester	论文送审之前 Before submitting the thesis	第六学期 Sixth semester
博士 Doctoral programs	第一学年 First year	第二学年 Second year	第三学期或第四学期 Third semester or forth semester	论文送审审批之前 Before submitting the thesis for examination and	论文送审结果为同意答辩者可申请答辩 Those whose thesis is approved of defense can

				approval	apply for the thesis/dissertation defense