

西安交通大学

XI'AN JIAOTONG UNIVERSITY

Graduate Program  
for International Students



Graduate School

2019.07



**数学与统计学院/理学院/航天航空学院**

*School of Mathematics and Statistics/School of  
Science/School of Aerospace Engineering*





**数学与统计学院/理学院/航天航空学院**  
**School of Mathematics and Statistics/School of Science/School of**  
**Aerospace Engineering**

**数理力学类国际研究生培养方案**

**International Graduate Programs in Mathematics, Physics and**  
**Mechanics**

★ 硕士研究生培养方案 (Masters Programs)

一、培养目标 (Program objectives)

本培养方案旨在培养德、智、体全面发展的综合性专业人才。具体要求如下:

This program is to educate students to develop all-roundly in morality, intelligence and physique. Specific requirements for the candidates are as follows:

1. 遵纪守法, 具有良好的思想品德、实事求是以及科学严谨的治学态度和优秀的学术道德;

Comply with the regulations and laws, attain good ideological quality and moral character, develop realistic and scientific and rigorous academic attitude, and follow excellent academic ethics.

2. 在专业领域掌握坚实的基础理论、科学研究方法和系统的专业知识, 具有从事科学研究和教学工作的能力;

Master solid basic theories, scientific research methods and systematic professional knowledge in the professional field, and have the ability to conduct independent scientific research and teaching work.

3. 掌握一门外国语, 能熟练地阅读专业文献, 撰写学位论文。

Master a foreign language, be able to read professional literature skillfully, and write their dissertation.

二、研究方向 (Research fields)

**数学 Mathematics:**

非线性泛函分析及应用 Nonlinear Functional Analysis and Application;

偏微分方程理论及应用 Theory and Application of Partial Differential Equations;

数论及其应用 Number Theory and Its Application;

几何分析 Geometric Analysis; 非线性微分方程 Nonlinear Differential Equation;

格上拓扑与非经典数理逻辑 Topological and Non-classical Mathematical Logic;

孤立子与非线性可积系统 Solitons and Nonlinear Integrable Systems;

偏微分方程的新型时空并行方法 A New Spatiotemporal Parallel Method for Partial Differential



**Equations;**

大规模科学计算 Large-scale Scientific Computing;

连续介质力学数学方法与计算 Mathematical Method and Calculation of Continuum Mechanics;

计算物理与计算流体 Computational Physics and Computational Fluids;

流体的高性能数值算法与应用 High Performance Numerical Algorithms and Application of Fluids;

近代优化理论、算法及应用 Theory, Algorithm and Application of Modern Optimization Method;

金融风险度量与金融最优化 Financial Risk Measurement and Financial Optimization;

图论与组合最优化 Graph Theory and Combination Optimization;

有限元分析及其应用 Finite Element Analysis and Its Application;

矩阵理论与数值代数 Matrix Theory and Numerical Algebra;

生物数学 Biological Mathematics;

随机动力学理论及应用建模 Stochastic dynamics theory and application modeling;

计算智能与信息技术的数学基础 Mathematical Basis of Computational Intelligence and Information Technology;

机器感知与信息处理的数学基础 Mathematical Basis of Machine Perception and Information Processing;

智能控制理论与应用 Theory and Application of Intelligent Control;

大型复杂系统瞬态计算理论 Transient Computing Theory for Large and Complex Systems;

智能计算与数据挖掘 Intelligent Computing and Data Mining;

机器学习 Machine Learning;

图像处理与分析中的数学方法 Mathematical Methods in Image Processing and Analysis;

大数据与分布式计算 Big Data and Distributed Computing;

无线通信系统的数学理论与分析 Mathematical Theory and Analysis of Wireless Communication System。

**统计学 Statistics:**

概率论与随机过程 Probability Theory and Stochastic Processes;

非参数统计 Nonparametric Statistics;

时间序列分析 Time series analysis;

数据科学基础与大数据分析 Data Science Essentials and Big Data Analysis;

空间数据分析 Spatial Data Analysis;

生物统计学 Biostatistics;

贝叶斯统计 Bayesian Statistics;

高维统计推断 High-dimensional Statistical Inference;

统计机器学习 Statistical Machine Learning;

计算统计学 Computational statistics;

金融统计与量化交易 Financial Statistics and Quantitative Transactions。

**物理学 Physics:****1. 理论物理 theoretical physics**

量子信息 quantum information;

量子场论 quantum field theory;

低维系统的结构与物理性质 Structure and Physical Properties of Low Dimensional Systems;

强关联系统 strong correlation system;

数学物理 mathematical physics。

**2. 光学 optics**

量子光学 quantum optics;

非线性光学 nonlinear optics;

空间光学 space optics;

成像光谱技术 imaging spectroscopy technology;

激光及其应用 laser and its application;

固体光谱学 solid state spectroscopy;

光学功能材料 optical functional materials;

光学测量 optical measurement;

光纤传感及通信技术 optical fiber sensing and communication technology;

光电子学及器件设计 photoelectronics and device design。

**3. 凝聚态物理 condensed matter physics**

固体的光学性质 optical properties of solids;

纳米功能材料 functional nanomaterials;

纳米管结构与物理性质 structure and physical properties of nanotubes;

磁学与磁性材料 magnetism and magnetic materials;

电子材料与器件 electronic materials and devices;

激光与物质相互作用 interaction between laser and matter。

**4. 原子与分子物理 atomic and molecular physics**

原子与分子的高激发态能级结构 Energy level structures of highly excited states of atoms and molecules;

新型光谱转换和存储材料 New spectral conversion and storage materials;

日光与大气相互作用 Interaction between solar and atmosphere;

太阳能功能材料与应用技术 Solar energy functional materials and application technology;

纳米金属粒子的电子能级结构和光电性质 electronic energy level structure and photoelectric properties of metal nanoparticles。

**化学 Chemistry:****1. 无机化学 Inorganic chemistry**

无机纳米化学 Inorganic nanochemistry;



无机-有机杂化材料 Inorganic-organic hybrid materials;

低维纳米材料研究 Low-dimensional nanomaterials;

物理无机化学 Physical inorganic chemistry;

## 2. 有机化学 Organic chemistry

有机氟化合物的合成与表征 Synthesis and characterization of organofluorine compounds;

生物碱的全合成 Total synthesis of alkaloids;

功能有机光电子材料 Functional organic optoelectronic materials;

过渡金属催化的串联 Transition metal catalyzed series connection;

烯烃环氧化及催化剂 Olefin epoxidation and catalysts;

手性药物合成及手性催化研究 Chiral drug synthesis and chiral catalysis;

食品中活性成分对人体健康的促进作用 Promoting effect of active ingredients in food on human health;

## 3. 物理化学 Physical chemistry

有机催化反应的分子模拟 Molecular simulation of organic catalytic reaction;

表面催化反应的分子模拟 Molecular simulation of surface catalytic reaction;

功能碳纳米材料的理论研究 Theoretical study on functional carbon nanomaterials;

催化动力学机理研究 Catalytic kinetics mechanism;

## 4. 分析化学 Analytical chemistry

纳米材料界面电化学 Interface electrochemistry of nanomaterials;

生物电化学检测 Bioelectrochemical detection;

发光分析 Luminescence analysis;

药物分析 Pharmaceutical analysis;

天然抗氧化活性成分分析方法学 Methodology of component analysis of natural antioxidant activities;

天然高分子化合物分析研究 Analysis of natural polymer compounds;

## 5. 高分子化学与物理 Polymer chemistry and physics

导电高分子材料 Conductive polymer materials;

大分子自组装 Self-assembly of macromolecules;

含氟聚合物的合成、表征与应用 Synthesis, characterization and application of fluorinated polymers;

高分子水凝胶 Polymeric hydrogel;

功能高分子材料（包括生物材料） Functional polymer materials;

电子材料 Electronic materials;

微纳米多相高分子 Micro-nano multiphase polymer;

新型聚合磷光材料 New polyphosphorescent materials;

聚合物增韧及机理研究 Toughening and mechanism of polymers;





高分子阻尼减震材料 Polymer damping and shock absorbing materials;

高性能涂膜材料的分子设计与性能调控 Molecular design and performance regulation of high performance coating materials。

**力学、航空宇航科学与技术专业**

**Mechanics; Aeronautical and Astronautical Science and Technology:**

结构/材料破坏机理和强度理论 Structure/ materials failure mechanism and strength theory;

多场耦合理论与结构轻量化 Multi-field coupling theory and structural lightweight design;

结构完整性与装备安全理论与技术 Theory and technology in structural integrity and security;

动力学与控制现代理论 Modern theories in dynamics and control;

流体力学与流固耦合 Fluid mechanics and fluid-solid coupling theory;

飞行器设计 Aircraft design;

先进飞行器导航、制导与控制 Theories in advanced aircraft navigation, guidance, and control;

航空宇航推进理论与工程 Aerospace propulsion theory and engineering;

航空宇航制造工程 Aerospace manufacturing engineering。

### 三、学习年限 (Length of programs)

国际硕士研究生学习年限一般为 2-3 年。

The length of Masters' programs is 2-3 years.

### 四、培养方式 (Program overview)

1. 硕士生培养实行导师负责制。可以根据培养工作的需要建立以导师为核心的指导小组，协助导师指导研究生。

The tutor-responsibility system is adopted in the education of Masters students. According to the needs of training work, a guidance group can be set up with a tutor as the core supervisor in guiding Master's students academically.

2. 指导教师应根据本培养方案和学生的个人情况，在学生入学前制定出培养计划，内容包括：研究方向、课程学习、文献阅读、选题报告、科学研究、学术交流、学位论文等方面的要求和进度计划。学生入学后两周内可以根据本人的具体情况对培养计划进行局部调整。

According to this training program and individual students' conditions, the supervisor should formulate a training plan after the student is registered. The contents of this plan include research field, course-learning, literature reading, dissertation proposal, scientific research, academic exchange, dissertation and other requirements and progress plans. Students can adjust their training plan according to their individual conditions within two weeks after enrollment.

3. 硕士生应通过课程学习加深理论基础，扩大知识面。课程学习多采用启发式、研讨式的教学方式，以自学为主，培养其独立分析和解决问题的能力。研究生应按照培养计划在第一至三学期内完成所有课程学习。

Masters students will deepen their theoretical foundation and expand their knowledge through course-learning. The course-learning mostly adopts heuristic and seminar teaching methods, and with student



self-study as basis to cultivate students' ability to independently analyze and solve problems. Postgraduates should complete all courses in the first three semesters according to the training plan.

4. 硕士生在第四学期末进行中期考核。考核通过者，继续攻读学位；不通过者，可参加下一次的考核，再次考核不通过者，予以分流处理。

At the end of the fourth semester, the graduate students will take the mid-term assessment. Those who pass the assessment shall continue to study for a degree; those who fail may take part in the next mid-term assessment, and those who fail the second assessment will be made terminate their program.

### 五、课程学习(Course work)

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，选修课学分根据专业学位课、总学分要求设置。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 academic Masters programs in Science and Engineering consist of at least 24 credits for course work. Required courses include *Comprehensive Chinese I* (2 credits), *Outline of China I* (2 credits), degree courses (no less than 8 credits), and elective courses (set by degree requirements). Innovation Harbour Lectures are included in elective courses for international students, 2 credits will be granted after attending 20 Lectures.

必修环节包括：学术活动（讲座）1 学分、中期考核 3 学分。

Other compulsory activities include academic lectures (Masters) (1 credit) and mid-term assessment (3 credits).

### 国际硕士研究生课程设置和学分要求

#### Curriculum Design and Credit Requirements of Master Programs

课程类型 Course Type	序号 No.	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	LITE610112	中国概况 Outline of China	2	必修 4 学分 4 credits required	
	2	LITE610227	综合汉语 Comprehensive Chinese	2		
专业学位课 Degree Course	1	MATH610307	非线性分析 Nonlinear Analysis	3	必修 9 学分 9 credits required	数学专业 Mathematics major
	2	MATH610407	代数学 Algebra	3		
	3	MATH711707	黎曼几何 Riemannian Geometry	3		
	4	STAT711207	高等概率论 Advanced Measure Theory	3	必修 9 学分 9 credits required	统计学专业 Statistics major
	5	STAT711507	高等数理统计 Advanced Mathematical Statistics	3		
	6	STAT611007	随机过程理论 Theory of	3		



课程类型 Course Type	序号 No.	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes	
			Stochastic Processes			
	7	MATH600207	计算方法 B Computational Method B	3	至少修 8 学分 A minimum of 8 credits required	力学、航空宇航科学与技术专业 Majors of Mechanics; Aeronautical and Astronautical Science and Technology
	8	AASP711006	航空航天结构分析 Aerospace Structural Analysis	2		
	9	AASP711106	旋转机械动力学 Dynamics of Rotating Machines	2		
	10	AASP711206	飞行动力学 Flight Dynamics	2		
	11	INSM610706	机械测量与无损检测 Electromagnetic Nondestructive Testing and Evaluation	2		
	12	AASP111106	超高声速空气动力学 Hypersonic Aerodynamics	2		
	13	MECH712506	软物质力学 Mechanics of Soft Materials	2		
	14	AASP611006	中级传热学 Intermediate Heat Transfer	2		
	15	MECH612706	连续性理论 PRINCIPLES OF CONTINUA	2		
	16	MECH612906	高等不可压缩流体力学 Advanced Incompressible Fluid Mechanics	2		
	17	MECH640106	材料的力学行为和微尺度模拟 Mechanical behavior of materials and micro-scale simulation	2		
	18	MECH740206	旋涡运动基础 Principle of Vortex Flows	2		
	19	MECH740106	高等材料力学 Advanced Mechanics of Materials	2		
	20	PHYS610309	高等量子力学 Advanced Quantum Mechanics	3		
	21	PHYS610809	高等电动力学 Advanced Electrodynamics	2		



课程类型 Course Type	序号 No.	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes	
	22	PHYS610409	高等热力学与统计物理 Advanced Thermodynamics and Statistical Physics	2	of 8 credits required	
	23	PHYS611409	高等光学 Advanced Optics	3		
	24	PHYS611209	信息光学 Information optics	2		
	25	PHYS610709	计算物理 Computational physics	2		
	26	PHYS611109	材料物理分析方法 Physical analysis of materials	2		
	27	PHYS610509	高等固体物理 Advanced solid state physics	2		
	28	PHYS640109	超强激光物理前沿 Frontiers of ultraintense laser physics	2		
	29	PHYS640209	追寻能源 The energy quest	2		
	30	CHEM610309	高等无机化学 Advanced Inorganic Chemistry	2		
	31	CHEM610209	高等有机化学 (2) Higher organic chemistry (II)	2		
	32	CHEM710409	量子化学原理 Principles of Quantum Chemistry	2		
	33	CHEM610409	高等分析化学 Advanced Analytical Chemistry	2		
	34	CHEM610609	配位化学 Coordination Chemistry	2		
	35	CHEM610809	现代无机合成化学 Modern inorganic synthetic chemistry	2		
	36	CHEM610909	现代有机合成化学 Modern Organic Synthetic Chemistry	2		
	37	CHEM610709	高分子合成化学 Polymer synthetic chemistry	2		
	38	CHEM710809	分离方法基础与技术 The Basis and Technology of Separation Method	2		



课程类型 Course Type	序号 No.	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes	
	39	CHEM610109	界面化学 Interface Chemistry	2		
	40	CHEM610509	高分子结构与性能 Structure and Properties of Polymers	2		
选修课 Elective Course	1	MATH610907	微分拓扑 Differential topology	2	至少修 6 学分 A minimum of 6 credits required	数学专业 Mathematics major
	2	MATH612107	现代数论 Topics in Modern Number Theory	2		
	3	MATH610707	动力系统及应用 Dynamical Systems	2		
	4	MATH611307	偏微分方程的现代理论 Modern Theory of Nonlinear Partial Differential Equations	2		
	5	MATH610507	凸分析与优化理论 Convex Analysis and Optimization Theory	2		
	6	MATH612207	科学计算的数学基 Foundation of Mathematics for Scientific Computing	2		
	7	MATH612307	信息科学的数学基础 Mathematical foundation of Information Sciences	2		
	8	MATH710707	广义函数与 Sobolev 空间 Introduction to Sobolev Spaces and Partial Differential Equations	2		
	9	/	在数理力学类研究生课程目录中选修 Choose from the catalog of graduate courses in Mathematics, Physics and Mechanics	/	至少修 5 学分 A minimum of 5 credits required	
	10	STAT610907	统计计算 Computational Statistics	2	至少修 6 学分 A minimum of 6 credits required	统计学专业 Statistics major
	11	STAT611107	统计推断 Statistical Inference	2		
	12	MATH610807	机器学习 Machine Learning	2		
	13	STAT611207	大数据分析基础 Foundations of Big Data Analysis	2		



课程类型 Course Type	序号 No.	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes	
	14	MATH811107	近代优化方法 Modern Optimization Method	2		
	15	STAT810207	近代回归分析 Modern Regression Analysis	2		
	16	STAT611307	经验过程与大样本理论 Empirical Processes and Asymptotic Statistics	2		
	17	STAT810307	现代信息论 Modern Information Theory	2		
	18	/	在数理力学类研究生课程目录 中选修 Choose from the catalog of graduate courses in Mathematics, Physics and Mechanics	/	至少修 5 学分 A minimum of 5 credits required	
	19	/	在数理力学类研究生课程目录 中选修 Choose from the catalog of graduate courses in Mathematics, Physics and Mechanics	/	至少修 12 学分 A minimum of 12 credits required	力学、航空宇 航科学与技术 专业 Majors of Mechanics, Aeronautical and Astronautical Science and Technology
	20	/	在数理力学类研究生课程目录 中选修 Choose from the catalog of graduate courses in Mathematics, Physics and Mechanics	/	至少修 12 学分 A minimum of 12 credits required	物理学专业 Physics Major
	21	CHEM810109	聚合物化学物理前沿 Frontier of Polymer Chemistry and Physics	2	至少修 8 学分 A minimum of 8 credits required	化学专业 Chemistry Major
	22	CHEM710509	功能高分子化学 Functional Polymer Chemistry	2		



课程类型 Course Type	序号 No.	全校统一编码 Course Code	课程名称 Course Title	学分 Credit	备注 Notes
	23	CHEM710909	现代生物材料 Modern biomaterials	2	
	24	CHEM710109	生物有机化学 Bioorganic Chemistry	2	
	25	CHEM710609	高等物理化学 Higher Physical Chemistry	2	
	26	CHEM710209	计算化学与分子设计导论 Introduction to Computational Chemistry and Molecular Design	2	
	27	CHEM611109	金属参与的现代有机合成 Metal Participation in Modern Organic Synthesis	2	
必修环节 Compulsory Activities	1	BXHJ600399	学术活动(讲座)(硕) (Lectures) (Masters)	1	必修 4 学分 4 credits required
	2	BXHJ600799	中期考核 Mid-term Assessment	3	

## 六、培养环节 (Compulsory Activities)

### 1. 学术活动 (讲座) (Lectures)

国际硕士研究生学术活动 (讲座) 分为必听讲座和选听讲座。必听讲座包括“科学道德与学风建设”1 次、“职业生涯发展与规划导论”1 次；选听讲座包括与学科紧密相关的“学科前沿系列专题讲座” (由各二级学科组织若干教授对本学科前沿知识进行讲座, 每个系列由 5 个以上讲座组成) 一个系列和在全校范围内选听“学术讲座”1 次, 完成全部 8 个讲座后记 1 学分。

Masters students are required to attend 8 lectures, including 2 compulsory (One on Scientific Morality and Construction of Study Style, and one on Introduction to Career Development and Planning), 5 discipline-specific frontiers lectures in a series (organized by respective schools), and 1 elective within the university. Students will obtain 1 credit with full attendance to 8 lectures.

### 2. 开题报告 (Dissertation Proposal)

硕士生应在第三学期内完成学位论文开题报告。硕士生查阅一定的国内外文献资料基础上, 填写《硕士研究生学位论文选题报告》。《硕士研究生学位论文选题报告》完成以后, 应组织公开的学位论文选题报告会。选题报告会的评审小组一般由 3-5 名专家组成。评审专家在选题报告会后就选题的意义、文献综述、研究内容、可能遇到的问题、是否通过选题等写出结论性的审查意见, 并将结果和相关材料留学院备案。



Masters students are required to complete the dissertation proposal during the third semester. On the basis of reading domestic and foreign literature, the students shall fill up the *Opening Report on Dissertation Topic for Master's Degree Candidate*. After the completion of the afore-mentioned report, a conference will be organized. The evaluation group of the topic selection report is generally composed of 3-5 experts. After the conference, the evaluation experts are responsible for writing a review on the significance of the topic, literature review, research content, possible problems, and whether the selected topic is acceptable. The results and related materials will be held in files by the respective school.

开题报告通过后才可参加中期考核。在学期间转专业、转导师以及在论文研究工作过程中，论文课题有重大变动的研究生，应依据现导师的意见，决定是否重新做开题报告。

Only after the opening report has passed the evaluation can the student apply for mid-term assessment. Masters' candidates who have changed their major or tutors in the middle of a semester, and those who have made great changes in their dissertation research during the research process should decide whether to submit a new Opening Report on Dissertation Topic based on the opinions of their current tutor.

### 3. 中期考核 (Mid-term Assessment)

研究生在通过开题报告后，在导师的指导下开展论文工作，中期考核是对研究生入学后的学习与科研状况的全面检查，着重考核研究生业务表现与论文工作进展情况。中期考核包括：学业成绩、选题报告、课题进展和综合能力四个方面。硕士生在第四学期末完成中期考核。

The mid-term assessment is a comprehensive assessment of the student's study performance and dissertation research progress. The mid-term assessment includes four aspects: performance of course work, opening report on dissertation topic, progress of the dissertation research and comprehensive abilities. Mid-term assessment must be finished before the end of the fourth semester.

中期考核由院系组织，考核小组由 5-7 名本学科或相关学科教师组成。研究生在参加中期考核前，需向学院提交由导师签字的课程成绩、课题研究进展报告等书面材料。考核小组依据研究生的学习成绩、论文选题报告和研究工作进展情况，对研究生的综合能力、论文工作进展以及工作态度、精力投入等进行全方位考查。考核通过后可继续攻读学位；不通过者，可参加下一次的中期考核，再次考核不通过者，按学校政策实行末位分流。

Mid-term assessment is organized by the respective school and department, and the assessment task group is composed of 5-7 teachers in their own discipline or related disciplines. Before taking part in the mid-term assessment, students should submit to the school written materials such as course grades signed by their tutor, opening report on dissertation topic, report on research progress and others. Based on those materials, the assessment task group will make an all-round evaluation of the student's comprehensive abilities. Those who pass the assessment can continue their research; those who fail have to take another mid-term assessment, and those who fail to pass the assessment again shall be made leave the program.

### 4. 预答辩 (Pre-oral Defense Reporting)

研究生完成学位论文后须在系所范围内组织预答辩，报告自己的研究成果。评审专家将严格审查论文选题意义，学位论文是否有独立见解，学位论文的工作量，推理的严格性。对预答辩中提出的问题，研究生要进行修改与补充，审批通过后方可进入论文评阅、答辩。对问题较多的学位论文要经过研究生修改后重新组织预答辩。

After completing their dissertation, students must take part in the pre-oral defense reporting organized





by the respective department and report their research results. The evaluation experts will strictly examine the significance of topic, whether independent opinions are demonstrated in the dissertation, the workload of the dissertation, and the preciseness of reasoning. Students should revise their dissertation according to the questions raised in the pre-defense report meeting. After the students pass the evaluation, the dissertation will be reviewed and the candidate shall present their research orally for defence. For dissertation with more questions, students should revise it and re-take the pre-defense report meeting and the following procedural steps.

### 5. 学位论文 (Dissertation)

硕士研究生用于学位论文工作的时间不得少于 1 年，选题应在学术上有一定意义，或在科学技术上有一定价值。鼓励硕士生自选题目，但须征得导师认可。

The time on the dissertation should be no less than one year, and the dissertation topic they select should be of academic significance or of scientific and technological value. Students are encouraged to choose their own dissertation topic, but must be approved by their tutor.

论文应在导师指导下，由研究生独立完成。论文应有一定的新见解，应能反映出研究生已掌握了坚实的基础理论和系统的专业知识，能较为独立的开展科学研究工作。学位论文的答辩和学位授予，按照《西安交通大学学位授予工作暂行办法》以及相关学院学位授予规定执行。

Dissertation research should be completed independently by students themselves under the guidance of their tutor. The dissertation shall demonstrate some new insights, which reflect their mastery of solid basic theory and systematic professional knowledge, and they are relatively able to carry out scientific research work independently. The defending of dissertations and the awarding of the degree shall be carried out in accordance with the Xi'an Jiaotong University Tentative Regulations on Degree Granting and the relevant regulations for degree granting of the respective school.

## 七、培养环节时间节点(Timeline and milestones)

	课程学习 Course Work	开题报告 Dissertation proposal	中期考核 Mid-term Assessment	预答辩 Pre-oral defence Reporting	论文答辩 Thesis/Dissertation Defense
硕士 (Masters programs)	第 1-3 学期 From 1 <sup>st</sup> -3 <sup>rd</sup> semesters	第 3 学期 3 <sup>rd</sup> semester	第 3 学期末(2 年毕业) End of the 3 <sup>rd</sup> semester (2-year program) 第 4 学期末(3 年毕业) End of the 4 <sup>th</sup> semester (3-year program)	正式答辩前一周 A week before the final oral defense	第 4 学期(2 年毕业) 4 <sup>th</sup> semester (2-year program) 第 6 学期(3 年毕业) 6 <sup>th</sup> semester (3-year program)

## ★ 博士研究生培养方案 (Doctoral Programs)

### 一、培养目标 (Program objectives)

本培养方案注重培养德、智、体全面发展，综合素质高的专业人才。具体要求如下：



This training program focuses on the cultivation of all-round development of morality, intelligence and physique, and high-quality professionals. Specific requirements for candidates are as follows:

1. 遵纪守法，具有良好的思想品德、实事求是及科学严谨的治学态度和优秀的学术道德。

Comply with the regulations disciplines and laws, attain have good ideological quality and moral character, develop realistic and scientific and rigorous academic attitude, and follow excellent academic ethics.

2. 在所学专业及其交叉领域掌握坚实宽广的基础理论、科学研究方法和系统深入的专业知识，具有较强的独立从事科学研究和教学工作的能力。

Master solidly and broadly basic theories, scientific research methods and systematic in-depth specialized knowledge in the discipline undertaken and its cross-disciplines, and have strong ability to perform scientific research and teaching work independently.

3. 在所学专业或其交叉领域能够做出创造性成果，能从事教学、科研或实际应用方面的工作。

Be able to produce creative results in their discipline or its cross-disciplines, and to engage in teaching, scientific research or practical applications.

## 二、研究方向（Research fields）

### 数学 Mathematics:

非线性泛函分析及应用 Nonlinear Functional Analysis and Application;

偏微分方程理论及应用 Theory and Application of Partial Differential Equations;

数论及其应用 Number Theory and Its Application;

几何分析 Geometric Analysis;

非线性微分方程 Nonlinear Differential Equation;

格上拓扑与非经典数理逻辑 Topological and Non-classical Mathematical Logic;

孤立子与非线性可积系统 Solitons and Nonlinear Integrable Systems;

偏微分方程的新型时空并行方法 A New Spatiotemporal Parallel Method for Partial Differential Equations;

大规模科学计算 Large-scale Scientific Computing;

连续介质力学数学方法与计算 Mathematical Method and Calculation of Continuum Mechanics;

计算物理与计算流体 Computational Physics and Computational Fluids;

流体的高性能数值算法与应用 High Performance Numerical Algorithms and Application for Fluids;

近代优化理论、算法及应用 Theory, Algorithm and Application of Modern Optimization Method;

金融风险度量与金融最优化 Financial Risk Measurement and Financial Optimization;

图论与组合最优化 Graph Theory and Combination Optimization;

有限元分析及其应用 Finite Element Analysis and Its Application;

矩阵理论与数值代数 Matrix Theory and Numerical Algebra;

生物数学 Biological Mathematics;



随机动力学理论及应用建模 Stochastic dynamics theory and application modeling;  
计算智能与信息技术的数学基础 Mathematical Basis of Computational Intelligence and Information Technology;  
机器感知与信息处理的数学基础 Mathematical Basis of Machine Perception and Information Processing;  
智能控制理论与应用 Theory and Application of Intelligent Control;  
大型复杂系统瞬态计算理论 Transient Computing Theory for Large and Complex Systems;  
智能计算与数据挖掘 Intelligent Computing and Data Mining;  
机器学习 Machine Learning;  
图像处理与分析中的数学方法 Mathematical Methods in Image Processing and Analysis;  
大数据与分布式计算 Big Data and Distributed Computing;  
无线通信系统的数学理论与分析 Mathematical Theory and Analysis of Wireless Communication System。

### **统计学 Statistics:**

概率论与随机过程 Probability Theory and Stochastic Processes;  
非参数统计 Nonparametric Statistics;  
时间序列分析 Time series analysis;  
数据科学基础与大数据分析 Data Science Essentials and Big Data Analysis;  
空间数据分析 Spatial Data Analysis;  
生物统计学 Biostatistics;  
贝叶斯统计 Bayesian Statistics;  
高维统计推断 High-dimensional Statistical Inference;  
统计机器学习 Statistical Machine Learning;  
计算统计学 Computational statistics;  
金融统计与量化交易 Financial Statistics and Quantitative Transactions。

### **物理学 Physics:**

#### **1. 理论物理 Theoretical physics**

量子信息 Quantum information;  
量子场论 Quantum field theory;  
低维系统的结构与物理性质 Structure and physical properties of low dimensional systems;  
强关联系统 Strong correlation system;  
数学物理 Mathematical physics。

#### **2. 光学 Optics**

量子光学 Quantum optics;  
非线性光学 Nonlinear optics;  
空间光学 Space optics;



成像光谱技术 Imaging spectroscopy technology;  
激光及其应用 Laser and its application;  
固体光谱学 Solid state spectroscopy;  
光学功能材料 Optical functional materials;  
光学测量 Optical measurement;  
光纤传感及通信技术 Optical fiber sensing and communication technology;  
光电子学及器件设计 Photoelectronics and device design。

### 3. 凝聚态物理 Condensed matter physics

固体的光学性质 Optical properties of solids;  
纳米功能材料 Functional nanomaterials;  
纳米管结构与物理性质 Structure and physical properties of nanotubes;  
磁学与磁性材料 Magnetism and magnetic materials;  
电子材料与器件 Electronic materials and devices;  
激光与物质相互作用 Interaction between laser and matter;

### 4. 原子与分子物理 Atomic and molecular physics

原子与分子的高激发态能级结构 Energy level structures of highly excited states of atoms and molecules;  
新型光谱转换和存储材料 New spectral conversion and storage materials;  
日光与大气相互作用 Interaction between solar and atmosphere;  
太阳能功能材料与应用技术 Solar energy functional materials and application technology;  
纳米金属粒子的电子能级结构和光电性质 Electronic energy level structure and photoelectric properties of metal nanoparticles。

### 力学、航空宇航科学与技术专业

#### **Mechanics; Aeronautical and Astronautical Science and Technology:**

结构/材料破坏机理和强度理论 Structure/ materials failure mechanism and strength theory;  
多场耦合理论与结构轻量化 Multi-field coupling theory and structural lightweight design;  
结构完整性与装备安全理论与技术 Theory and technology in structural integrity and security;  
动力学与控制现代理论 Modern theories in dynamics and control;  
流体力学与流固耦合 Fluid mechanics and fluid-solid coupling theory;  
飞行器设计 Aircraft design;  
先进飞行器导航、制导与控制 Theories in advanced aircraft navigation, guidance, and control;  
航空宇航推进理论与工程 Aerospace propulsion theory and engineering;  
航空宇航制造工程 Aerospace manufacturing engineering。

### 三、学习年限 (Length of programs)

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) will have to be



approved by the university authority.

#### 四、培养方式 (Program overview)

1. 研究生培养实行导师负责制。可以根据培养工作的需要建立以导师为核心的指导小组，协助导师指导研究生。

The tutor-responsibility system is adopted in the education training of Masters graduate students. According to the needs of training work, a guidance group can be set up with a tutor as the core supervisor core to assist his/her work in guiding PhD students academically.

2. 指导教师应根据本培养方案和学生的个人情况，在学生入学前制定出培养计划，内容包括：研究方向、课程学习、文献阅读、选题报告、科学研究、学术交流、学位论文等方面的要求和进度计划。学生入学后两周内可以根据本人的具体情况对培养计划进行局部调整。

According to this training program and individual students' personal conditions, the supervisor tutor should formulate a training plan after the student is registered before students' enrollment. The contents of this plan include: research field, course-learning, literature reading, topic selection report, scientific research, academic exchange, dissertation and other requirements and research progress plans. Students can adjust their training plan according to their individual specific conditions within two weeks after registration.

3. 研究生应通过课程学习加深理论基础，扩大知识面。课程学习多采用启发式、研讨式的教学方式，以自学为主，培养其独立分析和解决问题的能力。研究生应按照培养计划在第一至三学期内完成所有课程学习。

PhD students will deepen their theoretical foundation and expand their knowledge through course-learning. The course-learning mostly adopts heuristic and seminar teaching methods, and with student self-study as basis, to cultivate students' ability to independently analyze and solve problems. PhD students should complete all courses in the first three semesters according to the training plan.

4. 博士生自第二学年起至第三学年末完成中期考核。考核通过者，继续攻读学位；不通过者，可参加下一次的中期考核，再次考核不通过者，予以分流处理。

From the second academic year to the end of the third academic year, PhD. students should complete their mid-term assessment. Those who pass the assessment will continue their program; those who fail have to re-take the next mid-term assessment, and those who fail the second assessment shall be made leave the program.

#### 五、课程学习(Course work)

学术学位博士生课程学习应至少取得 12 学分，包括：公共课（汉语（II）2 学分、中国概况（II）2 学分）4 学分、专业学位课至少 4 学分，选修课学分根据专业学位课、总学分要求设置。

The academic doctoral programs (except in Philosophy, Politics, and Economics) consist of at least 12 credits for course work. Required courses include *Comprehensive Chinese II* (2 credits), *Outline of China II* (2 credits), degree courses (no less than 4 credits), and elective courses (set by degree requirements).

必修环节包括：学术活动（讲座）2 学分、开题报告 2 学分、中期考核 6 学分。



Other compulsory activities include academic lectures (doctoral) (2 credits), dissertation proposal (2 credits), and mid-term assessment (6 credits).

国际博士研究生课程设置和学分要求

(Curriculum Design and Credit Requirements of Doctoral Programs)

课程类型 Course Type	序号 NO.	课程编号 Course Code	课程名称 Course Name	学分 (Credit)	备注 remarks
公共学位课 Public Course	1	LITE610112	中国概况 Outline of China	2	必修 4 学分 4 credits required
	2	LITE610227	综合汉语 Comprehensive Chinese	2	
专业学位课 Degree Course	<b>数学 Mathematics</b>				
	1	MATH811007	非线性泛函分析 Nonlinear Functional Analysis	2	至少修 6 学分 A minimum of 6 credits required
	2	MATH713107	计算机数学 Computer Mathematics	2	
	3	MATH611607	偏微分方程正则性理论 Regularity Theory of Partial Differential Equations	2	
	4	MATH811107	近代优化方法 Modern Optimization Method	2	
	5	MATH710807	椭圆与抛物方程 Elliptic and Parabolic Partial Differential Equations	2	
	<b>统计学 Statistics</b>				
	1	STAT810707	随机微分方程 Stochastic Differential Equations	2	至少修 6 学分 A minimum of 6 credits required
	2	STAT810207	近代回归分析 Modern Regression Analysis	2	
	3	STAT810607	集成学习 Ensemble Learning	2	
	4	MATH811107	近代优化方法 Modern Optimization Method	2	



课程类型 Course Type	序号 NO.	课程编号 Course Code	课程名称 Course Name	学分 (Credit)	备注 remarks
	5	MATH713107	计算机数学 Computer Mathematics	2	
	<b>力学-航空宇航科学与技术 Mechanics; Aeronautical and Astronautical Science and Technology</b>				
	1	MATH600207	计算方法 B Computational Method B	2	至少修 4 学分 A minimum of 4 credits required
	2	AASP711006	航空航天结构分析 Aerospace Structural Analysis	3	
	3	AASP711106	旋转机械动力学 Dynamics of Rotating Machines	2	
	4	AASP711206	飞行动力学 Flight Dynamics	2	
	5	INSM610706	机械测量与无损检测 Electromagnetic Nondestructive Testing and Evaluation	2	
	6	AASP111106	超高声速空气动力学 Hypersonic Aerodynamics	2	
	7	MECH712506	软物质力学 Mechanics of Soft Materials	2	
	8	AASP611006	中级传热学 Intermediate Heat Transfer	2	
	9	MECH612706	连续性理论 PRINCIPLES OF CONTINUA	2	
	10	MECH612906	高等不可压缩流体力学 Advanced Incompressible Fluid Mechanics	2	
	11	MECH640106	材料的力学行为和微尺度模拟 Mechanical behavior of materials and micro-scale simulation	2	
	12	MECH740206	旋涡运动基础 Principles of Vortex Flows	2	
	13	MECH740106	高等材料力学 Advanced Mechanics of Materials	2	
	<b>物理学 Physics</b>				



课程类型 Course Type	序号 NO.	课程编号 Course Code	课程名称 Course Name	学分 (Credit)	备注 remarks
	1	PHYS711409	凝聚态物理导论 Introduction to Condensed Matter Physics	2	至少修 4 学分 A minimum of 4 credits required
	2	PHYS610209	量子光学 Quantum Optics	2	
	3	PHYS611309	成像光谱与遥感物理 Imaging Spectrum and Remote Sensing Physics	2	
	4	PHYS610909	固体光谱学 Solid State Spectroscopy	2	
	5	PHYS611509	量子信息导论 Introduction to Quantum Information	2	
	6	PHYS610609	软凝聚态物理学选讲 Selected lectures on soft condensed matter physics	2	
	7	PHYS611009	纳米材料的光学性质 Optical Properties of Nano-materials	2	
	8	PHYS610509	高等固体物理 Advanced Solid Physics	2	
	9	PHYS640209	超强激光物理前沿 Frontiers of ultraintense laser physics	2	
	10	PHYS640109	追寻能源 The Energy Quest	2	
选修课 Elective Course	1	/	在数理力学类研究生课程目录中选修 Choose from the catalog of graduate courses in Mathematics, Physics and Mechanics	/	至少修 4 学分 A minimum of 4 credits required
必修环节 Compulsory Activities	1	BXHJ800399	学术活动(讲座) (博) Lectures ( Doctoral)	2	必修 10 学分 10 credits required)
	2	BXHJ800499	开题报告 Dissertation Proposal	2	
	3	BXHJ800199	中期考核 Mid-term Assessment	6	

## 六、培养环节 (Compulsory Activities)





### 1. 学术活动（讲座）（Lectures）

国际博士研究生学术活动（讲座）分为必听讲座和选听讲座。必听讲座为“科学道德与学风建设”；选听讲座包括与学科紧密相关的“学科前沿系列专题讲座”（由各二级学科组织若干教授对本学科前沿知识进行讲座，每个系列由 5 个以上讲座组成）一个系列和在全校范围内选听“学术讲座”1 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。

Doctoral students are required to attend 7 lectures, including a compulsory lecture (a lecture on Scientific Morality and Construction of Study Style), 5 lectures in a series related to the frontiers of the disciplines related to the discipline undertaken (organized by respective schools), and 1 elective within the university. In addition, they are also required to give a lecture. Students will obtain 2 credits by completing the whole series of activities. Innovation Harbour Lectures are included in elective courses for international students, 2 credits will be granted after attending 20 Lectures.

### 2. 开题报告（Dissertation Proposal）

博士生应在第三学期内完成开题报告。学位论文开题报告应不少于 1 万字，内容包括论文题目，选题意义，国内外研究现状，拟定研究计划，各个阶段的主要内容、目标、完成期限，工作难点及特色，预期成果以及可能产生的创新点等（参考文献不少于 100 篇，其中外文文献 30 篇以上）。选题报告会以学术活动的形式在学院内公开进行，并在学院官网公示，由系所组织考核小组进行评审，并将结果和相关材料留学院备案。

Doctoral students should complete the dissertation proposal during the third semester. The opening report should be no less than 10,000 words, including the title of the dissertation, the significance of the topic, the status quo of the current research home and abroad, the research plans, the main contents of each stage, objectives, completion deadlines, difficulties and characteristics of the work at each stage, as well as expected results and possible innovations (no less than 100 references, of which more than 30 are in foreign languages). The reporting will be conducted in the form of an academic activity in the respective school and will be announced on the official webpage of the respective school. The topic will be evaluated by the evaluation task group organized by the corresponding Departments, and the results and related materials will be saved as files in the record by the school.

开题报告通过后才可参加中期考核。在学期中转专业、转导师以及在论文研究工作过程中，论文课题有重大变动的研究生，应依据现导师的意见，决定是否重新做开题报告。

Only after the opening report passes can the student apply for the mid-term assessment. Students who changed their major or tutor in the middle of a semester, and those who made great changes in their dissertation research during the research process should decide whether to submit a new opening report in light of the opinions of their current tutor.

### 3. 中期考核（Mid-term Assessment）

研究生在通过开题报告后，在导师的指导下开展论文工作，中期考核是对研究生入学后的学习与科研状况的全面检查，着重考核研究生业务表现与论文工作进展情况。

Mid-term assessment is a comprehensive evaluation of the students' study and progress of research, particularly their performance of course work and the progress of the dissertation research.

中期考核包括：课业成绩、选题报告、课题进展和综合能力四个方面。博士生自第二学年起至第三学年末完成中期考核。



The mid-term assessment includes four aspects: course performance, topic selection reporting, progress of the dissertation research and comprehensive abilities. PhD students must complete their mid-term assessment from the second academic year to the end of the third academic year.

中期考核由院系组织，考核小组由 5-7 名本学科或相关学科教师组成。研究生在参加中期考核前，需向学院提交由导师签字的课程成绩、课题研究进展报告等书面材料。考核小组依据研究生的学习成绩、论文选题报告和研究工作进展情况，对研究生的综合能力、论文工作进展以及工作态度、精力投入等进行全方位考查。考核通过后可继续攻读学位；不通过者，可参加下一次的中期考核，再次考核不通过者，按学校政策实行末位分流。

Mid-term assessment is organized by the respective school and department, and the assessment task group is composed of 5-7 teachers in their own discipline or related disciplines. Before taking part in the mid-term assessment, students should submit to the school written materials such as course grades signed by their tutor, opening report on dissertation topic, report on research progress and others. Based on those materials, the assessment task group will make an all-round evaluation of the student's comprehensive abilities. Those who pass the assessment can continue their research; those who fail have to take another mid-term assessment, and those who fail to pass the assessment again shall be made terminate the program.

#### 4. 预答辩 (pre-oral defense Reporting)

博士研究生在学位论文送审之前，应在院内公开进行预答辩，并在学院官网公示，由系所组织考核小组进行评审。

Before submitting the dissertation for review, the doctoral candidates should make a public pre-oral defense reporting in the school and announce it on the official webpage of the school. The evaluation group organized by the Department will evaluate the performance of the reporting.

在预答辩中，由研究生报告自己的研究成果，考核小组将严格审查论文选题的意义、学位论文是否有独立见解、学位论文的工作量、推理的严格性等。对预答辩中提出的问题，研究生应认真修改与补充，对问题较多的学位论文，研究生应修改后重新进行预答辩。预答辩通过后，填写“博士学位论文预答辩情况”表报送学院审核，学院审批后进入论文评阅和学位论文答辩环节。对问题较多的学位论文，要经过研究生修改后重新组织预答辩。

In the pre-oral defense reporting, the PhD candidates shall report their research results, and the evaluation group will strictly evaluate the significance of the topic, whether independent opinions are demonstrated in the dissertation, the workload of the dissertation, and the preciseness of reasoning. The students should carefully revise the dissertation, address the questions raised in the pre-oral defense reporting meeting. For the dissertation with more problems, the candidate should revise it and re-take the pre-oral defense reporting. After the pre-oral defense reporting passes the evaluation, the student will fill up the form of "Description of the Pre-oral defense Reporting of Doctoral Dissertation" and submit it to the school for approval. After the school's approval is granted, the dissertation will be sent out for reviewing and the candidate shall take part in the oral dissertation defense. For dissertations with more problems, a second pre-oral defense reporting should be organized after the student revises it.

#### 5. 学位论文 (Dissertation)

博士学位论文工作是博士生在校期间的最主要工作，是研究生培养质量和学术水平的集中反映。博士生在校期间应把主要精力投入到与博士学位论文有关的科学研究和学术论文的撰写上。



Doctoral dissertation is the main work of doctoral students in school, and it is a concentrated reflection of the quality of graduate training and academic level. Doctoral students should devote their main energy to scientific research and the writing of academic papers related to their doctoral dissertation.

博士学位论文应在导师的指导下，由研究生本人独立完成。论文选题应是从本学科的某一研究方向提出的，对科学技术的发展或国民经济具有较大理论意义以及具有一定学术水平和使用价值的课题。学位论文应有较强的系统性和创造性成果（至少呈现三个创新点），应能反映出研究生已掌握了本学科坚实而宽广的基础理论和系统深入的专门知识，并具有独立从事科学研究工作的能力。为保证论文质量，论文工作必须有一定工作量，用于论文工作的实际时间应不少于两年。

The doctoral dissertation should be completed independently by the PhD candidate him/herself under the guidance of the tutor. The topic of the dissertation should be drawn from a certain research area of his/her discipline, which is of great theoretical significance to the development of science and technology or national economy, as well as of certain academic and application value. The dissertation should have sufficient systematic and creative achievements (at least three innovative points). It should reflect that the PhD candidate has grasped solidly and broadly the basic theories and systematic in-depth expertise of the discipline, and has the ability to conduct scientific research independently. In order to ensure the quality of the dissertation, the PhD candidate must reflect the dissertation research required efforts that were of adequacy, and the actual time spent on the dissertation should be no less than two years.

博士生达到学校及学院学位申请条件后，可进行论文送审。在依照学位论文评审专家的意见对论文进行修改，并满足学校和学院的答辩条件后，方可进行学位论文答辩。答辩决议报学院、学校学位评定委员会评议，在满足学院相关规定与要求的前提下，按照《西安交通大学学位授予工作暂行办法》最终决定是否授予其博士学位。

Doctoral students can submit their dissertation for reviewing after they have met the requirements for applying for academic degree of the school and the university. The dissertation can be defended only after it is revised according to the opinions of the dissertation evaluation experts and meets the conditions for dissertation defense of the school and the university. The resolution on dissertation defense shall be submitted to the Academic Degree Assessment Committee of the school and university for evaluation. On the premise of meeting the relevant regulations and requirements of the school and the university, the final decision shall be made as to whether to award the doctor's degree in accordance with Xi'an Jiaotong University Tentative Regulations for Degree Granting.

## 七、培养环节时间节点(Timeline and milestones)

	课程学习 Course Work	开题报告 Dissertation Proposal	中期考核 Mid-term Assessment	预答辩 Pre-oral defense Reporting	论文答辩 Thesis/Dissertat ion Defense
博士 Doctoral programs	第 1-3 学期 From 1 <sup>st</sup> -3 <sup>rd</sup> semesters	第 3 学期 3 <sup>rd</sup> semester	第 4 学期 4 <sup>rd</sup> semester	第 6-12 学期 From 6 <sup>st</sup> -12 <sup>rd</sup> semesters	第 7-12 学期 From 7 <sup>st</sup> -12 <sup>rd</sup> semesters