Mathematics (070100) Doctoral Students

Training program（International Students）

数学学科（070100）博士研究生

培养方案（留学生）

一、 Discipline Introduction

Mathematics is one of the oldest disciplines at Shanghai University. In 1984, the doctoral program of "Computational Mathematics" was approved. And in 1990, the doctoral program of "Operational Research and Cybernetics" was approved. The mobile post-doctoral station for mathematics was established in 1998. In 2006, it was approved as the first-level discipline doctoral program of "Mathematics", which became one of the only five first-level doctoral discipline programs at Shanghai University at that time, and it was also the only one of the first-level discipline doctoral programs in mathematics in Shanghai local universities. For a long time, based on the international frontier, focusing on the key issues in the economic construction of the country and Shanghai, mathematics discipline has made a number of influential scientific research achievements and trained many outstanding talents. The mathematics discipline has made great progress after the first, third, fourth and fifth issues of Shanghai Municipal Commission of Education in 1984, 1995, 2002 and 2007, the key discipline of Shanghai "operation research and Cybernetics" in 2008, the construction of mathematics which is the first class discipline in Shanghai in 2012 and the construction of plateau discipline in colleges and universities of Shanghai since 2014. According to the latest round of discipline evaluation by the Ministry of Education, among the 182 participating universities, Shanghai University scored B+, ranking 19th with Lanzhou University, Dalian University of Technology, Xiamen University and other universities, entering the top 10.4%. QS (2022) ranked 251st in

the world, and the mainland ranked 20th; ESI (2022) ranked 4.76 ‰, mainland ranked 28th; USNEWS (2021) (2021.11) ranked 103rd in the world, 19th in the mainland.

Mathematics at Shanghai University has a team of disciplines which is led by academicians and mainly composed of young and middle-aged teachers. The team includes internationally renowned professors, Yangtze River scholars from the Ministry of Education, National Science Foundation for Distinguished Young Scholars recipients, Shanghai Thousand Talents, Chinese Academy of Sciences Hundred-Talents Program, Shanghai Leading Talents, Shanghai "Dawn" Scholars, Shanghai Pujiang Talent Program, Shanghai Young Oriental Scholars, etc.

Shanghai Institute of Applied Mathematics and System Science, Shanghai University Core Mathematics Institute, Shanghai University Optimization and Open Laboratory, Shanghai University Mathematics and Encoding Cryptography Institute, Shanghai University Tensor and Matrix Research Center, Shanghai University System Science Institute are all affiliated Department of Mathematics. Shanghai Youth Science and Technology Talent Training Base—Shanghai University Mathematical Science Practice Workstation is the first mathematics workstation in the country.

From 2017 to 2021, the Mathematics Department of Shanghai University has newly hosted 51 National Natural Science Foundation of China (NSFC) and 2 China Postdoctoral Innovative Talent Support Programs. In terms of scientific research papers, the mathematics discipline published more than 580 papers included in SCI, and maintained 20 ESI highly cited papers. In terms of scientific research awards, 1 third prize of Shanghai Natural Science in 2017, and 1 third prize of Shanghai Natural Science in 2018. In addition, the mathematics subject won the first prize of Shanghai Higher Education Teaching Achievement Award in 2018. One scholar was selected as one of the global highly cited scientists in 2018, who is also the first global highly cited scientist in Shanghai University. A mathematician won the Best Paper Award called Ruolin Award presented by the 2017 International Consortium of Chinese Mathematicians (ICCM).

The employment rate of doctors in the past five years has reached 100%, most of which, accounting for 97.22%, are employed in higher education institutions. And

there is one person in each of the units of secondary and primary education, scientific research and design, and state-owned enterprises.

一、 领域简介

上海大学数学学科是上海大学历史最悠久的学科之一。1984 年获批“计算数学”博士点，1990 年获批“运筹学与控制论”博士点，1998 年建成数学博士后流动站、2006 年获批“数学”一级学科博士点，成为上海大学当时仅有的 5 个一级博士点之一，也是上海地方高校中唯一一个数学一级博士点。长期以来，数学学科立足国际前沿、聚焦国家和上海经济建设中的关键问题，取得了一批有影响的科研成果，培养了众多杰出人才。数学学科经过 1984，1995，2002，2007 年第一、三、四、五期上海市教委重点学科、2008 年上海市重点学科“运筹学与控制论”、2012 年上海市一流学科——数学，2014 年至今上海市高校高原学科的一系列建设，取得了长足的发展。根据教育部第四轮学科评估，在 182 家参评高校中，上海大学数学学科得分 B+，与兰州大学、大连理工大学、厦门大学等高校并列第 19 位，进入前 10.4%。QS（2022）全球排名并列 251，内地并列第 20 名；ESI（2022）全球 4.76‰，内地排名第 28 名；USNEWS（2021）（2021.11）全球第 103 名，内地第 19 名。

上海大学数学学科拥有一支由院士领衔，包括国家高端人才、教育部长江学者、国家杰出青年基金获得者、上海市高端人才、中国科学院百人计划、上海领军人才、曙光学者、上海浦江人才计划、上海市蓄水池计划、上海青年东方学者等中青年为主的学科队伍。

上海市应用数学与系统科学研究所、上海大学核心数学研究所、上海大学优化开放实验室、上海大学数学与编码密码研究所、上海大学张量与矩阵研究中心、上海大学系统科学研究所均挂靠数学系；上海市青少年科技人才培养基地—上海大学数学科学实践工作站是全国首家数学工作站。

2017-2021 年，新增主持国家自然科学基金 51 项，其中包括 1 项国家自然科学基金重点项目、中国博士后创新人才支持计划 2 项；在科研论文方面发表了 SCI 收录论文 580 余篇，保持 ESI 高被引论文 20 篇；在科研获奖方面：2017、2018、2020 年度各获上海市自然科学三等奖 1 项。2018 年度获上海市级高等教育教学成果奖一等奖 1 项。连续入选 2018-2020 年全球高被引科学家 1 名。2017

年度获世界华人数学家联盟主持颁发的最佳论文奖——若琳奖 1 项。2020 年获数学教育界最高奖项之一：保罗·厄尔多斯奖 1 项，获博士后创新人才支持计划十大创新成果 1 项，获中国运筹学会青年科技奖 1 项。

近五年博士就业率 100%，其中，大多就业于高等教育单位，占比 97.22%；中、初等教育单位、科研设计单位和国有企业各 1 人。

二、Degree Standard

In this subject, the main research direction are the core issues and across-application of mathematics research. It cultivates students with solid basic theories, high mathematics literacy, extensive analytical techniques, and advanced computational skills, as well as the ability and innovative spirit to engage in scientific research independently. Have the ability to solve relevant problems in theoretical research or practical application, and make innovative achievements in related research directions or professional technologies. Specifically, the basic research doctoral students should have strong abstract thinking ability in logical reasoning, analysis and synthesis, discovery and proof, refutation and conjecture, etc. Also, they should have the ability to construct the corresponding abstract mode by means of clear definition and engage in pure form research with this direct object. For the applied research doctoral students, they should have the ability to discover or refine the important problems of other disciplines and engineering technology related to mathematics. Besides, they should have the comprehensive ability to apply mathematical knowledge and use computers to research and solve practical problems in a certain field of science or engineering.

二、 学位标准

本学科以数学研究的核心问题和交叉应用为主要研究方向，培养学生扎实的基础理论、较高的数学素养、广泛的分析技术、先进的计算能力，具有独立从事科学研究工作的能力和创新精神。具有解决理论研究或实际应用中的相关问题的能力，在有关研究方向或专业技术上做出创新性的成果。具体地，针对基础研究类博士生应具备较强的逻辑推理、分析综合、发现与证明、反驳与猜测等方面的抽象思维能力，具有能借助于明确定义构造出相应的抽象模式并以此为直接对象

从事纯形式研究的能力；针对应用研究类博士生应具备发现或提炼其他学科和工程技术与数学相关的重要问题的能力，具备运用数学知识、借助计算机研究与解决科学或工程某一领域实际问题的综合能力。

三、Training Objective

1. Abide by discipline and law, have good moral character, rigorous style of study, physical and mental health, have a strong spirit of exploration, have a strong spirit of enterprise and dedication to science, and actively serve the socialist modernization.

2. Have broad feelings of home and country, rigorous scientific spirit and profound humanistic quality.

3. Have systematic and solid basic mathematical theories and professional knowledge, have certain innovative spirit and ability, and can be competent in teaching and scientific research in mathematics and related fields, and have integrated development of moral, intellectual and physical education.

4. Have strong academic communication skills and the good spirit of teamwork.

5. Strictly abide by academic norms and academic ethics, consciously resist the unhealthy atmosphere of eager for quick success and instant benefit, shoddy manufacturing and self-interest at the expense of others in research work, and consciously safeguard the purity and seriousness of academic undertakings.

6. To learn the theory of innovation and entrepreneurship, to cultivate the ability of innovation and entrepreneurship, and to enhance the basic skills of innovation and entrepreneurship.

7. To use the computer and mathematical software skillfully, have the ability of independent theoretical research, or can use professional knowledge to cooperate with relevant professionals to solve some practical application problems, and make results with theoretical or practical significance in a certain application direction.

8. more proficient in using a foreign language, have good foreign language expression ability, can read the foreign language literature of this major, and have the ability to write foreign language scientific research papers.

三、 培养目标

1．遵纪守法，品德良好，学风严谨，身心健康，具有较强的探索精神，具有较强的事业心和献身科学的精神，积极为社会主义现代化建设服务。

2．具有博大的家国情怀、严谨的科学精神和深厚的人文素养。

3. 掌握系统和坚实的数学基础理论和专业知识，具有一定创新精神和创新能力、能够胜任数学学科及相关领域教学和科学研究工作，德、智、体全面发展。

4. 具有较强的学术沟通能力和良好的团队协作精神。

5. 严格遵守学术规范和学术道德，自觉抵制研究工作中急功近利、粗制滥造、损人利己等不良风气，自觉维护学术事业的纯洁性和严肃性。

6. 学习创新创业理论，培养创新创业能力，增强创新创业的基本技能。

7. 能熟练运用计算机及数学软件，具有独立进行理论研究的能力，或运用专业知识与有关专业人员合作解决某些实际应用问题的能力，在某个应用方向上做出有理论或实践意义的成果。

8. 较为熟练地使用一门外语，有良好的外语表达能力，能阅读本专业的外文文献，并具有撰写外文科研论文的能力。

四、Length of service

The length of degree for Doctoral candidates usually takes in 3 years, the maximum length of schooling for Doctoral candidates should not exceed 8 years.

四、 学习方式及学习年限

本专业攻读博士学位的学制 3 年，博士研究生最长学习年限不超过 8 年。

五、Training orientation

1．Pure Mathematics

2．Computational Mathematics

3．Applied Mathematics

4．Operational Research and Cybernetics

五、 研究方向

1．基础数学

2．计算数学

3．应用数学

4．运筹学与控制论

六、Language requirements

International students need to have the ability to learn and communicate in Chinese, understand Chinese courses, and meet the graduation requirements in listening, speaking, reading and writing.

六、 语言要求

留学生需要具有中文学习交流的能力，能听懂中文课程，在听说读写方面满足毕业要求。

七、Training methods and tutor requirements

The training method is a combination of individual mentoring or advisor team guidance. Advisors need to have overseas study or work experience.

七、培养方式及导师要求

培养方式为导师个别指导和团队集体指导相结合。导师需要有海外学习或工作经历。

八、Curriculum and Credit Requirements

The minimum credit for doctoral students in this subject (including academic seminar credits) is 22 credits, including 7 credits for public courses, no less than 8 credits for professional courses, 2 credits for academic standards and writing courses, 2 credits for innovative entrepreneurship courses, and 3 credits for academic seminars. Detailed settings please check the schedule.

八、课程设置及学分要求

本学科博士生的学分(含学术研讨课学分)最低为 22 学分，其中公共课 7 学分、专业基础课不低于 8 学分、学术规范与写作课 2 学分、创新创业课 2 学分、学术研讨课 3 学分。详细设置请查看附表。

九、Development plan

The graduate student who studies for a doctoral degree shall, under the guidance of his tutor, draw up a training plan in accordance with the requirements of the current training program of current year of the subject. Within one month after admission, enter the postgraduate management system and enter the training plan. At the same time, the printed paper version of the training plan submitted to each degree evaluation sub-committee for examination and approval, retained by the college record. All courses included in the training programme must be qualified to answer.

九、培养计划制定

攻读博士学位的研究生入学后，应在导师指导下按照本学科当年度培养方案的要求制订培养计划，在入学后 1 个月内,登录研究生管理系统，输入培养计划,同时，打印的纸质版培养计划报各学位评定分委员会审核批准后，由学院留存备案。凡列入培养计划的课程必须修读合格方可进行答辩。

十、Required links

1. Course assessment

Course studies are required to end within the first school year. The system of diversion and elimination is applied to students' course study, each course score must be above 75 points, and the course examination less than 75 points need to be rebuilt.

2. The opening report of dissertation and mid-term examination

(1) Topic selection: the research topic of this thesis should be related to the frontier research of this major or the important application problems in the national economic construction related to this major.

(2) Opening conditions: should complete the required credits, should complete the training program required credits and submit more than 8000 words of literature reading special reports and 2-3 summary reports of the symposium. At least one SCI academic paper has been systematically completed before applying to open the paper.

(3) Opening requirements: Opening within one years (doctoral students) or three years (successive postgraduate and doctoral programs of study). The content includes literature review, significance of topic selection, research goals and difficulties,

expected results and possible innovations. No less than 40 references shall be cited.

(4) Opening review: Organize the centralized opening review and make comments. Those who fail to pass the review shall be given a warning, and they can be reviewed once in half a year. Those who still fail to pass the review will be dealt with in accordance with the relevant regulations on the management of student status.

(4.1) The implementation of the system of centralized opening review for Academic Dissertations. Set up a subject dissertation opening review group, which is responsible for organizing the centralized thesis opening review of postgraduates in the discipline.

(4.2) Implementation of the tutor avoidance system. Generally, there are no less than 5 members in the opening review group of academic dissertation, including no less than 2 off campus experts.

(4.3) Strict separation and elimination. Rank the examination results of the graduate students who participate in the concentrated opening review of the dissertation, and deal with the unqualified graduate students in strict accordance with the examination requirements.

(5) Mid-term assessment: In the mid-term of the research of the thesis, within the scope of the opening report plan, conduct periodic reports and mid-term assessment of the progress of the thesis to ensure that the thesis is completed according to the schedule. In the mid-term assessment, 7 teachers with senior titles of first-level disciplines (at least 4 professors) shall be organized to listen to the progress report and make comments. Those who fail to pass the review shall be given a warning and they can be reviewed once in half a year. Those who still fail to pass the review will be dealt with in accordance with the relevant regulations on the management of student status. Students who failed in the mid-term assessment one time shall be listed in the observation list, and students who failed in the mid-term assessment two times shall be listed in the shunt elimination list.

3. International academic exchange

Doctoral students must meet one of the following conditions before pre-defense：

(1) At least one overseas academic exchange experience；

(2) Participate in at least one high-level international conference of the discipline or workshop themed seminar hosted by the discipline;

(3) At least one short-term visit to an internationally renowned university for 3 months or more.

4. Thesis pre-defense

Those who have completed the content of the teaching training plan within the prescribed study period, completed the course learning and required grades in the compulsory course, and completed the degree thesis and passed the preliminary review of the instructor and the review of 2-3 professors, conduct pre-defense in school.

(1) Implement the system of centralized pre defense. Set up the pre Defense Committee of academic dissertation, which is responsible for organizing the pre defense work of graduate students in the discipline.

(2) Implement the tutor avoidance system. Generally, there are no less than 5 members of the pre Defense Committee of academic dissertation, including no less than 2 off campus experts.

(3) Strict separation and elimination. The examination results of the postgraduates who participated in the pre oral defense of the dissertation were sorted, and the unqualified postgraduates were treated strictly according to the examination requirements.

5. Thesis defense

(1) After passing or amending the pre-defense in the school, and then passing the double-blind review by the school, two peer experts with a high professional title (including experts from outside units) must be sent for communication review. Only after all experts agree to reply, can the thesis defense be organized.

(2) The defense committee is composed of five (or seven) experts with high professional titles, of which more than half are outside experts and less than half are reviewers.

十、必修环节

1. 课程考核

课程学习要求在第一学年内结束。对学生课程学习实行分流淘汰制度，每门课程成绩必须都在 75 分以上，课程考试不满 75 分需重修。

2. 论文开题报告与中期考核

(1) 选题：论文的研究课题应与本专业的前沿研究相关或者来自本专业相关的国民经济建设中的重要应用问题。

(2) 开题条件：应当修满规定学分，应修满培养计划规定的学分和递交 8000 字以上文献阅读专题报告及 2—3 篇学术讨论会小结报告。至少有一篇 SCI 学术论文已系统完成，方可申请开题。`

(3) 开题要求：在入学一年内（博士生）或三年内（硕博连读生）开题。内容包括文献综述、选题意义、研究目标与难点、预期成果和可能的创新点等部分。引用文献不少于 40 篇。

(4) 开题评审：组织集中开题并进行评议，评议通过后方可开题。对评议不通过者给予警告，半年后可复审一次，仍不通过者，按学籍管理有关规定给予处理。

(4.1) 实施学位论文学科集中开题制度。成立学科学位论文开题小组，负责组织本学科内研究生的学位论文集中开题工作。

(4.2) 实行导师回避制度。学科学位论文开题小组成员一般不少于 5 人，其中校外专家不少于 2 人。

(4.3) 严格分流淘汰。对参加学位论文集中开题研究生的考核结果进行排序，并严格按照考核要求对不合格的研究生进行处理。

(5) 中期考核：在论文课题研究中期，在开题报告计划的范围内，对论文进展情况进行阶段性报告和中期考核，以保证论文按进度完成。中期考核需组织 7 名一级学科高级职称（至少 4 名教授）的教师听取进展报告并进行评议。对评议不通过者给予警告，半年后可复审一次，仍不通过者，按学籍管理有关规定给予处理。中期考核答辩 1 次不合格的学生进入观察名单，中期考核 2 次答辩不合格的学生进入分流淘汰名单。

3. 国际学术交流

博士生在预答辩之前须满足如下条件之一：

(1) 至少有一次国（境）外学术交流的经历；

(2) 至少参加一次本学科高水平国际会议或本学科主办的 Workshop 主题研讨会；

(3) 至少有一次国际知名学府为期 3 个月及以上的短期访学。

4.论文预答辩

在规定的学习年限内修完教学培养计划规定的内容，完成课程学习和必修环节，成绩合格者，在完成学位论文并经指导教师初审、2—3 名教授复审认可后，进行校内预答辩。

(1) 实施集中预答辩制度。成立学科学位论文预答辩委员会，负责组织本学科内研究生的学位论文集中预答辩工作。

(2) 实行导师回避制度。学科学位论文预答辩委员会成员一般不少于 5 人，其中校外专家不少于 2 人。

(3) 严格分流淘汰。对参加学位论文集中预答辩研究生的考核结果进行排序，并严格按照考核要求对不合格的研究生进行处理。

5.论文答辩

(1) 校内预答辩通过或者修改通过后，再经校双盲评审通过后，发送 2 名同行正高职称专家(其中必须有外单位专家）通信评审。全部专家同意答辩后，方可组织论文答辩。

(2) 答辩委员会由 5（或 7）名正高职称专家组成，其中校外专家大于一半，论文评阅人小于一半。

十一、Scientific research and thesis work

The scientific research of doctoral students of this major should be conducted under the guidance of the supervisor, who has the responsibility and obligation to provide the necessary conditions, facilities and funds for the scientific research of the graduate students. The following are some of the basic requirements of the dissertation:

（1）The topic reflects theoretical value or application value, and has certain prospects for development.

（2）The content fully demonstrates the author has a solid and broad theoretical foundation and systematic knowledge in physics.

（3）The research theme is clear, the structure is reasonable, the conclusion is distinct, and the logic of analysis and demonstration is rigorous. The results of the paper should contain some innovative findings.

（4）The research method should reflect the methodology of science.

（5）The format of dissertation must be standardized: titles should be concise and focused; Expression of the main body must be fluent, avoid using literary or emotional non-academic words, and typesetting should be neat and standardized; Charts and formulas are standardized; References are complete and standardized.

十一、学位论文

本学科的博士生的科学研究工作应在导师的指导下进行，指导老师有责任和义务为所指导的研究生提供必要的科学研究的条件、设施和经费。学位论文的基本要求（详见文件《上海大学理学学科（数学）研究生申请学位创新成果要求》）：

(1) 论文选题应有较高的理论意义或应用价值。

(2) 论文内容应体现出作者的知识水平及对系统的专门知识的掌握情况。

(3) 论文的结果应有创新性。

(4) 论文的研究方法应体现出科学性。

(5) 论文格式正确、语句通顺、图表清晰、引文准确规范。

附表. 课程设置与必修环节

学术学位博士/硕士研究生（留学生）课程设置与必修环节

类别 Course Category	课程编号	课程名称 Course name	学时 class hour	学分 Credits	开课学期 Term	备注 Remark
公共课 Public Courses	0LY000001	中国概况 General Situation of China	60	3	3	必修 Compulsory
	0LY000002	综合汉语 B Comprehensive Chinese B	60	3	2	
	0CS000027	公共体育 Public Physical Education	20	1	1	
专业基础课 Major Courses	2XB011001	几何分析 (Geometric Analysis)	40	4	1	五选二 Two out of five
	2XBL01102	可积偏微分方程 (Integrable Partial Differential Equations) (全英文授课)	40	4	2	
	2XBL01103	代数基础 (Basic Algebra)	40	4	1	
	2XB011004	高等数值分析 (Advanced Numerical Analysis)	40	4	1	
	2XB011005	高等运筹学 (Advanced Operational Researches)	40	4	1	
学术规范与写作课 Academic Standards and Writing Course	7XBL01101	学术规范与写作课 (Academic Standards and Writing)	20	2	3	必修 Compulsory

<table>
<tr><td>创新创业课
Innovation and Entrepreneurship Course</td><td>4XB011001</td><td>数学前沿与创新
(Frontier and Innovation in Mathematics)</td><td>20</td><td>2</td><td>1</td><td>必修
Compulsory</td></tr>
<tr><td>学术研讨课
Academic Seminar Course</td><td>6CB000001</td><td>学术研讨课
(Academic Seminars)</td><td></td><td>3</td><td></td><td>必修
Compulsory</td></tr>
<tr><td>跨院系、专业选修课
Cross-Disciplinary Optional Courses</td><td colspan="6">学生可根据自身情况在导师指导下跨院系、专业选取非本专业课程列入培养计划，课程学分计入总学分。
Under the guidance of supervisors, students can select cross-disciplinary optional courses as part of their program. The course scores will be incorporated into the total academic score.</td></tr>
<tr><td>补修课
Designated Complementary Courses</td><td colspan="6">根据学生具体情况由导师指定选修硕士生/本科生主干课 2-3 门（不计入总学分）
Students are required to select two to three undergraduate courses designated by the supervisors, which will not be incorporated into the total academic score.</td></tr>
<tr><td rowspan="4">必修环节
Required Steps</td><td colspan="3">课程考核
Course Scores</td><td>4</td><td rowspan="4">须通过考核后方可进入下一环节
Move to the next step only after confirming the previous step</td></tr>
<tr><td colspan="3">论文开题与中期考核
Thesis Proposal and Mid-Term Evaluation</td><td>5/7</td></tr>
<tr><td colspan="3">论文预答辩
Thesis Pre-Defense</td><td>11</td></tr>
<tr><td colspan="3">论文答辩
Thesis Final Defense</td><td>11</td></tr>
</table>