

南方科技大学  
学术型博士研究生培养方案

SUSTech

Doctoral Program (Research Degree) for International Students

一级学科名称

物理学

Name of the First-level Discipline

Physics

一级学科代码

0702

Code of the First-level Discipline

适用于 2023 级

This PhD Program applies to the international doctoral students admitted in 2024

2024 年 4 月 28 日

2024—04—28

## 一、培养目标 Program Objectives

|  |
|--|
| 1. 要求掌握本专业领域的基础理论以及系统深入的专门知识，具有严谨的治学态度、理论与实践相结合的科学方法和作风；   |
| 1. Master the fundamental theories and systematic, in-depth special knowledge in the professional field; hold a rigorous attitude towards academic studies; adopt scientific methods and styles combining theories with practice;                      |
| 2. 具有独立从事科学研究工作的能力，并在学科相关领域做出创新性的成果；   |
| 2. Have the ability of independent scientific research and make innovative achievements in discipline-related fields;  |
| 3. 能够熟练掌握英语，检索、查阅本专业英文资料，撰写英文学术论文，并具有良好的英语听说能力以及进行国际学术交流能力；  |
| 3. Have good English proficiency to retrieve and consult English literature in the professional field and write academic papers in English; have good English listening and speaking abilities and be able to conduct international academic exchange; |
| 4. 具有良好的身体和心理素质，学术视野开阔，善于在研究工作中与其他学科交叉渗透，做出突出成绩；   |
| 4. Have good physical and psychological qualities; hold a broad academic vision; be skillful in relating to other disciplines in researches; make outstanding achievements.  |

## 二、主要学科方向 Major Research Areas

| 序号<br>NO. | 学科方向<br>Research Areas            | 主要研究方向<br>Main Research Focus  |
|-----------|-----------------------------------|--|
| 1         | 凝聚态物理<br>Condensed Matter Physics | 1. 凝聚态理论 Condensed Matter Theory<br>2. 半导体物理 Semiconductor Physics<br>3. 材料物理 Materials Physics<br>4. 凝聚态物理及其交叉方向 Condensed Matter Physics and Interdisciplinary Fields<br>5. 高压物理 High-pressure physics |
| 2         | 理论物理<br>Theoretical Physics       | 1. 场论与粒子物理<br>1. Field Theory and Particle Physics<br>2. 引力理论以及宇宙学<br>2. Theory of Gravity and Cosmology<br>3. 天体物理<br>3. Astrophysics   |

|   |   |  |
|---|---|--|
| 3 | 计算物理<br>Computational Physics             | 1. 计算凝聚态物理<br>1. Computational Condensed Matter Physics<br>2. 计算材料学<br>2. Computational Materials Science  |
| 4 | 光学<br>Optics                              | 1. 量子光学<br>1. Quantum Optics<br>2. 激光光谱学<br>2. Laser Spectroscopy<br>3. 光电子学<br>3. Photoelectronics<br>4. 光学及其交叉方向<br>4. Optics and Interdisciplinary Fields                       |
| 5 | 原子与分子物理<br>Atomic and Molecular Physics   | 1. 超冷原子<br>1. Ultracold Atoms<br>2. 精密测量<br>2. Precision Measurement   |
| 6 | 量子科学与技术<br>Quantum Science and Technology | 1. 量子信息与量子计算<br>1. Quantum Information and Quantum Computing<br>2. 量子光学<br>2. Quantum Optics<br>3. 量子材料与器件<br>3. Quantum Materials and Devices<br>4. 量子模拟<br>4. Quantum Simulation |

### 三、学习年限 Program Duration

| 类型<br>Type of Students                           | 基本学习年限<br>Normal Program Duration |
|--|-----------------------------------|
| 硕士起点博士研究生<br>PhD students with a master's degree | 4 years                           |

### 四、应修学分 Required Credits

|                                 | 课程类别<br>Course Type               | 学分<br>Credits |
|---------------------------------|-----------------------------------|---------------|
| 公共课<br>General Required Courses | 英语课<br>English language courses   | 2             |
|                                 | 中国汉语课<br>Chinese language courses | 4             |
|                                 | 中国概况课<br>Chinese cultural courses | 2             |
|                                 | 通识通修课                             | 2             |

|  | General research courses |    |
|--|--------------------------|----|
| 专业课<br>Discipline-based courses              |                          | 3  |
| 学术活动<br>Seminar                              |                          | 2  |
| 劳动教育<br>Labor Education                      |                          | 1  |
| 开题报告<br>Doctoral dissertation opening report |                          | 1  |
| 中期考核<br>Mid-period assessment                |                          | 1  |
| 最终学术报告<br>Final academic report              |                          | 1  |
| 总计<br>Total                                  |                          | 19 |

## 五、学术活动 Academic Activities

博士生应定期参加课题组的学术讨论会，并在申请答辩前完成听讲报告 16 次和主讲报告 2 次。听讲报告包括科学道德与学风建设类讲座、实验室安全教育类讲座、心理健康教育与咨询类讲座和职业素养与规划类讲座各 1 次，其他听讲报告为与学生学科方向相关的学术报告。主讲报告需为公开报告，开展前需向培养单位报备，开题报告、中期报告和最终学术报告如公开，也可计算其中。学生需在教务系统中上传听讲和主讲记录，满足学术活动要求后经培养单位审查通过，记 2 学分。

PhD students are required to regularly participate in academic seminars hosted by the research group, and should listen 16 lectures and give two presentations before applying for thesis defense. There are four lectures that students need to attend at least one time, including lectures on scientific ethics and academic conduct, laboratory safety education, mental health education and counseling, and professional development and planning. The rest of lectures will be related to the student's academic discipline. The two presentations should be public and must be reported to the department before the presentation. Proposal, midterm, and final academic report can also be counted into the requirement of presentation, if they are public. Students are required to upload records of their listening and speaking activities on the academic system. After meeting the academic activity requirements and being approved by the department, students will earn 2 credits.

## 六、劳动教育 Labor Education

研究生劳动教育应结合产业新业态、劳动新形态等新型生产劳动和服务型劳动，运用学科和专业开展实习实训、专业服务、社会实践、创新创业、校内外志愿者服务、专门设计的劳育课程、劳育相关讲座、实验室卫生维护、实验室日常管理、实验室安全管理等，50 分钟记为一个学时，累计不少于 32 个学时。完成后在研究生教务系统中提交《劳动教育活动记录表》，经培养单位审核通过后记 1 学分。

Labor education for postgraduate students should be combined with new forms of production labor and service-oriented labor, such as new industrial trends and forms of labor. Internships, professional services, social practice, innovation and entrepreneurship, volunteer services both on and off campus, specifically designed labor education courses, lectures related to labor education, laboratory hygiene maintenance, laboratory daily management, and laboratory safety management should be carried out, utilizing disciplinary and professional knowledge. Each session shall be recorded as 50 minutes, and no less than 32 sessions shall be required for completion. After completion, submit a "Labor Education Activity Record Table" in the graduate academic system, and upon approval by the department, 1 credit shall be awarded.

## 七、开题报告 Doctoral Dissertation Proposal Assessment

**内容：**选题背景及意义、文献综述、研究基础及思路、可行性分析、工作特色及难点、预期成果及可能的创新点等。

**Contents:** The background and significance of the chosen topic, literature review, research foundation and plan, feasibility analysis, unique features and challenges of the project, expected outcomes and potential areas for innovation.

**时间：**博士研究生应在第三个学期结束前完成开题报告。

**Time:** The PhD student shall finish the thesis proposal before the end of the third semester;

**方式：**提交书面报告加答辩。

**Mode:** Submit a written report to attend the oral defense.

**撰写语言：**中英文均可，开题报告需与学位论文语言类型保持一致。

**Language of writing:** Both Chinese and English are acceptable, but the language type of the thesis proposal should be consistent with that of the thesis.

**组织：**博士开题考核的答辩时长不少于 30 分钟。开题考核委员会由至少 5 名相

关学科的博士研究生导师组成，委员总人数为奇数（可包括导师），答辩秘书可由获得过相关学科博士学位的人员担任。

**Organization:** The duration of the doctoral thesis proposal defense shall not be less than 30 minutes. The thesis proposal defense committee shall consist of at least 5 doctoral supervisors in relevant disciplines, with a total odd number of members (including supervisors), and the defense secretary may be appointed by someone who has obtained a doctoral degree in a relevant discipline.

**结果:** 考核结果采取不记名投票方式，经全体成员二分之一以上同意方可通过，考核通过记为 1 学分。未按时参加开题报告的，成绩记为不通过。第一次开题报告未通过的（包括未按时参加第一次开题报告），应在 6 个月内进行第二次开题报告。第二次开题报告未通过的（包括未按时参加第二次开题报告），予以结业或退学。

**Result:** The assessment result is based on an anonymous voting system. It can only be passed with the agreement of more than half of the committee members. Passing the assessment will be counted as 1 credit. Those who fail to attend the thesis proposal on time will be marked as failed. Those who fail the first thesis proposal (including those who fail to attend the first proposal on time) should conduct the second proposal within 6 months. Those who fail to pass the second proposal presentation (including those who do not attend the second proposal presentation on time) will be either awarded a certificate of the study experience or expelled from school.

## 八、中期考核 Mid-period Assessment

**内容:** 对已经开题的博士生就论文工作进展情况以及工作态度和精力投入等进行全面考查。

**Content:** A comprehensive assessment will be carried out on the progress of the thesis work, as well as the working attitude and invested efforts of doctoral students who have passed the proposal assessment.

**时间:** 博士中期考核应在第五学期结束前完成。

**Time:** The mid-term assessment for the doctorate should be completed before the end of the fifth semester.

**方式:** 书面报告加答辩。

**Method:** A written report and defense session are required.

**撰写语言:** 中英文均可。

**Writing language:** Both Chinese and English can be used.

**组织:** 中期考核答辩时长不少于 30 分钟, 主要内容为开题后的论文进度。考核委员会由至少 5 名相关学科的博士研究生导师组成, 委员总人数为奇数(可包括导师), 答辩秘书可由获得过相关学科博士学位的人员担任。

**Organization:** The mid-term assessment defense should last no less than 30 minutes, with the main focus being on the progress of the thesis work since the proposal phase. The assessment committee consists of at least five doctoral supervisors in relevant disciplines, and the total number of committee members is an odd number (including the supervisors). The defense secretary can be appointed by someone who has obtained a doctorate degree in a relevant field.

**结果:** 考核结果采取不记名投票方式, 经全体成员二分之一以上同意方可通过, 考核通过记为 1 学分。未按时参加中期考核的, 成绩记为不通过。第一次中期考核未通过的(包括未按时参加第一次中期考核), 应在 6 个月内进行第二次中期考核。第二次开题报告未通过的(包括未按时参加第二次中期考核), 予以结业或退学。

**Result:** The assessment results will be conducted through anonymous voting, and can only be passed with the agreement of more than half of all members. Passing the assessment will earn one credit. Those who do not participate in the mid-term assessment on time will have their grades recorded as unsatisfactory. Those who fail the first mid-term assessment (including those who do not participate in the first mid-term assessment on time) must complete a second mid-term assessment within 6 months. Those who fail the second proposal defense (including those who do not participate in the second mid-term assessment on time) will be either awarded a certificate of the study experience or expelled from school.

## 九、最终学术报告 Final Academic Report

在学位论文工作基本完成以后, 最迟于正式申请答辩前三个月, 每位博士生必须做一次论文工作总结报告(预答辩), 邀请 5 名以上同行专家(评议委员会需要有至少 1 名培养单位学位评定分委员会成员参加), 对论文工作的主要成果和创新性等进行评议, 广泛听取意见。交叉学科的报告应在每个相关学科聘请至少一位专家参加, 答辩秘书可由获得过相关博士学位的人员担任。最终学术报告通过后, 方可记 1 学分, 进入学位申请与答辩环节。

如果评议专家认为论文工作量和创新性不符合博士学位论文的要求, 给予不通过的决定, 则要延期至少半年重新进行最终学术报告。

After the completion of the basic work of the thesis, no later than three months before the formal application for defense, each doctoral student must make a summary report of their thesis work (pre-defense), inviting more than five peer experts (at least one member of the degree evaluation subcommittee of the department needs to be present on the review committee) to evaluate the main results and innovation of the thesis work, and widely solicit opinions. Interdisciplinary

reports should invite at least one expert from each relevant discipline. The defense secretary can be appointed by someone who has obtained a relevant doctoral degree. After the final academic report is approved, one credit can be awarded, and it can enter the degree application and defense stage.

If the review experts believe that the amount and innovation of the thesis work do not meet the requirements of the doctoral thesis, a decision of not passing will be given, and it will be postponed for at least six months to re-conduct the final academic report.

## 十、学位论文总体要求 General Requirements of PhD Dissertation

**学术水平：**博士学位论文研究的实际工作时间一般不少于两学年，应体现作者具备本学科坚实的理论基础和科学正确的方法论，以及系统性解决相关领域科研问题和挑战的能力。学位论文应能够分析总结本学科领域的发展趋势、国内外相关科研进展以及存在的关键问题，并能系统阐释该研究工作的学术价值，以及在业内的重要性。

**Academic Level:** The practical working time for a doctoral dissertation generally lasts no less than two academic years, and should reflect the author's solid theoretical foundation and scientifically correct methodology in this discipline, as well as the ability to systematically solve relevant research problems and challenges in the field. The thesis should be able to analyze and summarize the trends in the development of the discipline, the domestic and international related scientific research progress, and the key problems that exist, and systematically explain the academic value of the research work and its importance in the industry.

**语言：**学位论文可用中、英文撰写，具体请参考博士学位论文撰写规范。

**Language:** The thesis can be written in Chinese or English. Please refer to the writing regulations for doctoral thesis for specific details.

**查重：**原则上“去除本人已发表文献复制比”低于5%，视为查重通过；复制比在5%~10%之间，须填写说明，导师签字确认同意后，视为通过；复制比高于等于10%，视为不通过。第一次查重未通过，经认真修改后，需经导师申请，进行第二次查重，如仍不通过，至少半年后接受该生的学位申请。

**Plagiarism Check:** In principle, a "copy ratio" of less than 5% of published works by the author is considered acceptable for plagiarism checking. A "copy ratio" between 5% and 10% requires an explanation and approval from the supervisor after signing. A "copy ratio" equal to or higher than 10% is considered unacceptable. If the first plagiarism check fails, after careful revision, the supervisor needs to apply for a second check. If the check still fails, the student's degree application will not be

accepted for at least six months.

## 十一、申请学位创新成果要求

### Requirements for innovative achievements of degree application

对实验系统的建设、新型理论模型和方法的创建、或较大型计算程序的开发等方面做出了重要贡献；或者其发表的学术论文或获批的发明专利体现出较大的系统性和创新性；具体情况由本学科学位委员会判断。所发表学术成果第一作者及通讯作者的署名单位均为南方科技大学。

Significant contributions have been made in the construction of experimental systems, the creation of novel theoretical models and methods, and the development of large-scale computational programs. Additionally, published academic papers and the approved invention patents reflect a high degree of systematization and innovation. The specific situation will be judged by the degree committee of the relevant discipline. The first and corresponding author of published academic achievements should be affiliated with Southern University of Science and Technology.

## 十二、学位论文评审 PhD Dissertation Examination

**时间：**通过学位论文的形式审查和论文重合度检查后，可申请学位论文评审；

**Time:** The student may apply for PhD Dissertation Examination after passing the formal examination and plagiarism check of PhD dissertation.

**方式：**送审至教育部学位与研究生教育发展中心的“学位论文质量检测服务平台”进行盲审，评审专家至少为5位。

**Method:** The thesis will be sent for blind review to the "Thesis Quality Inspection Service Platform" of the Degree and Graduate Education Development Center of the Ministry of Education, and at least five experts will be involved in the review process.

**结果：**博士研究生通过评审后应在导师的指导下根据专家意见认真修改论文。如送审结果出现单 C，学生需按照送审意见认真修改论文，距离答辩时长由培养单位学位评定分委员会确定，一般为1-3个月；如送审结果2个或2个以上 C，学生需按照送审意见认真修改论文，距离答辩时间不得少于6个月；如送审结果出现 D，学生需按照送审意见认真修改论文重新送审，具体送审份数由培养单位学位评定分委员会确定，距离答辩时间一般不得少于1年。如出现特殊情况，需交由培养单位学位评定委员会审议后提交物理学学位评定分委员会复议。另外，送审结果存在 C 的情况，需导师在培养单位学位评定分委员会上出席

说明情况，培养单位代表在物理学学位评定分委会上出席说明情况。

**Result:** After receiving review comments, doctoral candidates should carefully revise their thesis according to the opinions of experts under the guidance of their supervisors. If the review results show a single C, the student needs to revise the thesis seriously according to the review opinions. The length of time from receiving review reports to defense is determined by the degree evaluation subcommittee of the department and is normally 1-3 months. If the review result shows two or more C, the student needs to revise the thesis seriously according to the review opinions and the time from receiving review reports to defense should not be less than six months. If the review result shows a D, the student needs to revise the thesis according to the review opinions and resubmit it for review. The number of referees of resubmissions shall be determined by the degree evaluation subcommittee of the department, and the time from receiving review reports to defense shall normally not be less than one year. In case of special circumstances, it shall be submitted to the degree evaluation committee of the department for approval and then submitted to the physics degree evaluation subcommittee for reconsideration. In addition, if the review result shows a C, the supervisor needs to attend the degree evaluation subcommittee of the department to explain the situation, and the representative of the department needs to attend the physics degree evaluation subcommittee to explain the situation.

### 十三、学位论文答辩 Oral Defense of PhD Dissertation

**时间:** 博士研究生通过学位论文评审后，可申请学位论文答辩；

**Time:** After passing the PhD Dissertation Examination, the PhD student may apply for the Oral Defense of PhD Dissertation;

**组织:** 博士学位论文答辩委员会由至少 5 名相关学科的专家组成，委员总人数为奇数，其中应至少有 2 名校外专家，及一名培养单位学位评定分委会成员出席。委员会主席一般由教授或具有相当职称的专家担任。所有委员应具备博士研究生导师资格和副高及以上职称，同时委员中半数以上是教授或相当职称的专家。导师可列席，不可担任主席或委员，闭门讨论时应回避。

**Organization:** The doctoral dissertation defense committee shall consist of at least 5 experts in relevant disciplines, with an odd number of members, including at least 2 external experts and a member of the degree evaluation subcommittee of the department of the candidate. The chairman of the committee is normally a professor

or an expert with equivalent professional title. All members should have the qualifications of a PhD supervisor and hold the title of associate professor or above. Meanwhile, more than half of the members should be professors or experts with equivalent professional title. The supervisor can attend the defense as an observer, but cannot serve as the chairman or a member of the committee. During the closed-door discussion, the supervisor should withdraw.

**结果:** 答辩决议采取不记名投票方式, 经全体成员三分之二或以上同意方可通过。学位论文答辩未通过者, 可在学校规定时间内修改论文, 经导师同意, 重新申请答辩。

**Result:** The resolution of the defense shall be adopted by means of anonymous voting, and shall only be passed with the agreement of two-thirds or more of all members. Those who fail the thesis defense may revise their thesis within the prescribed time of the school, and, with the approval of the advisor, reapply for the defense.

#### 十四、其他说明 Others

学科学位评定分委员会意见：

Comments from the Degree Assessment Sub-committee of the Discipline:

Signature of the Committee Chair:  
(Stamp)

Date:

# 物理学培养方案附录

## Appendices to the Doctoral Program in Physics

### 附录一：课程设置 Appendix I: Courses

| 课程类别<br>Course Type  | 课程代码<br>Course Code | 课程名称<br>Course   | 开课学期<br>Semester     | 学分<br>Credits | 周学时/<br>总学时<br>Weekly<br>Credit<br>Hours/Total<br>Credit Hours |
|--|---------------------|--|----------------------|---------------|--|
| 公共课<br>General<br>Required<br>Courses  | CLE033              | 中国文化<br>Introduction to Chinese Culture  | 春/秋<br>Spring & Fall | 2             | 2/32   |
|  | CLE034              | 中国历史<br>Introduction to Chinese History  | 春/秋<br>Spring & Fall | 2             | 2/32   |
|  | GGC5046             | 南科大研究生英语<br>SUSTech Post-graduate English  | 春/秋<br>Spring & Fall | 2             | 2/32   |
|  | CLE7001             | 基础汉语 I<br>Elementary Chinese I   | 秋<br>Fall            | 2             | 2/64   |
|  | CLE7002             | 基础汉语 II<br>Elementary Chinese II   | 春<br>Spring          | 2             | 2/64   |
|  | GGC5042             | 科技论文检索与写作<br>Literature Research and Academic<br>Writing (or other English writing<br>courses) | 秋<br>Fall            | 2             | 2/32   |
| 必修课<br>(要求不<br>低于 3 学<br>分)<br>Degree<br>Compuls<br>ory<br>Courses<br>(not<br>lower<br>than<br>3credits<br>required) | PHY5001             | 高等量子力学<br>Advanced Quantum Mechanics   | 秋<br>Fall            | 4             | 4/64   |
|  | PHY5003             | 高等统计物理<br>Advanced Statistical Physics   | 秋<br>Fall            | 3             | 3/48   |
|  | PHY5004             | 高等固体物理<br>Advanced Solid State Physics   | 春<br>Spring          | 4             | 4/64   |
|  | PHY5012             | 量子信息<br>Quantum Information  | 秋<br>Fall            | 3             | 3/48   |
| 选修课<br>Elective  | PHY5013             | 先进电子显微学<br>Advanced Electron Microscopy  | 秋<br>Fall            | 3             | 3/64   |

|         |         |  |             |   |      |
|---------|---------|--|-------------|---|------|
| Courses | PHY5008 | 量子输运理论<br>Quantum Transport Theory             | 春<br>Spring | 3 | 3/48 |
|         | PHY5010 | 薄膜物理<br>Physics of Thin Film                   | 秋<br>Fall   | 3 | 3/48 |
|         | PHY5030 | 量子场论导论<br>Introduction to Quantum Field Theory | 秋<br>Fall   | 4 | 4/64 |
|         | PHY5050 | 高等宇宙学<br>Advanced Cosmology                    | 春<br>Spring | 3 | 3/48 |
|         | PHY5051 | 光子学原理<br>Principles of Photonics               | 春<br>Spring | 3 | 3/48 |
|         | PHY5052 | 冷原子物理<br>Cold Atom Physics                     | 春<br>Spring | 3 | 3/48 |
|         | PHY5056 | 非线性光学原理<br>Principle of Nonlinear Optics       | 秋<br>Fall   | 3 | 3/48 |
|         | PHY5059 | 超导物理 I<br>Basic Aspects of Superconductivity   | 秋<br>Fall   | 2 | 2/32 |

Note:

Elementary Chinese I & II, totaling 4 course credits, are mandatory for international students. Both courses would help students develop an equivalent language ability of level-3 of Chinese Proficiency Test (HSK), which is required for graduation.

博士留学生的中文能力在毕业时应至少达到《国际汉语能力标准》三级水平（等同于 HSK 汉语水平考试三级）。完成《基础汉语 I&II》课程的留学生汉语综合运用能力可达到 HSK 三级。

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Appendices revised on 28<sup>th</sup> April, 2024