华北电力大学（留学生）英语授课

North China Electric Power University (International Student) Taught in English

核科学与技术一级学科硕士学位研究生培养方案

Training Program for Postgraduates in First-level Discipline of Nuclear Science and Technology

（学科代码：0827　　授予工学硕士学位）

(Discipline Code: 0827, Degree: Master Degree of Engineering)

一、学科简介

I. Brief Introduction to the Discipline

本学科于 2011 年获得“核科学与技术”一级学科硕士学位授予权，2012 年自设“核电与动力工程”二级学科博士学位授予权，2018 年获得“核科学与技术”一级学科博士学位授予权。目前拥有“非能动核能安全技术”北京市重点实验室、“核电软件”国家能源重点实验室、“核动力工程全范围虚拟仿真”国家级实验教学中心、国家级“核电工程实践教育中心”。本学科现有一支 40 人的“博士化、工程化、国际化” 师资队伍，其中双聘院士 1 人，博士生导师 8 人，教授 10 人，副教授 13 人，其专业面覆盖“核科学与技术”一级学科的所有学科方向。本学科承担了众多国家级科研项目，近五年主持或参与了 “大型先进压水堆”国家科技重大专项、国家重点研发计划、国家自然科学基金等重大项目 60 余项，企业委托研究项目 50 余项，科研经费总额近 1 亿元；发表 SCI 论文 200 余篇，EI 论文 300 余篇；授权发明专利 60 余项，软件著作权 50 余项。为国家累计培养各类核电技术人才 2000 多人，为“一带一路”国家培养研究生 57 人，被列为国家第三批特色专业建设点。

In 2011, the discipline was authorized to award the master degree of the first-level discipline of Nuclear Science and Technology; in 2012, the discipline was authorized to award the doctoral degree of the second-level discipline of Nuclear Power and Power Engineering (self-established); in 2018, the discipline was authorized to award the doctoral degree of the first-level discipline of Nuclear Science and Technology. At present, it has the Beijing Key Laboratory of "Passive Safety Technology for Nuclear Energy", State Key Energy Laboratory of "Nuclear Power Software", National Experimental Teaching Center of "Nuclear Power Engineering Full Range Virtual Simulation", and National "Nuclear Power Engineering Practice Education Center". At present, the discipline has a teaching team consisting of 40 "doctoral, engineering and international" teaching staff, including 1 double-employed academician, 8 doctoral supervisors, 10 professors

and 13 associate professors, with its majors covering all orientations of the first-level discipline of Nuclear Science and Technology. The discipline has undertaken numerous state-level scientific research projects, and in the past five years, presided over or participated in more than 60 major projects such as the National Science and Technology Major Project of "Large Advanced Pressurized Water Reactor" , the National Key R&D Program of China, and the NSFC projects, and more than 50 major projects entrusted by enterprises, with a total scientific research funding of nearly RMB 100 million; more than 200 SCI papers and 300 EI papers have been published; more than 60 invention patents and 50 software copyrights have been granted. It has cumulatively trained more than 2,000 nuclear power technical talents for the country and 57 postgraduate students for the Belt and Road Initiative, and has been listed as the third batch of construction sites of characteristic specialty in China.

二、培养目标

II. Training Objectives

1． 培养对中国有良好认知，理解中国社会主流价值观，具有相应的中文语言能力，具备一定跨文化和全球胜任力，在所在学科具有相当专业知识和学术能力的国际化人才。

1. Cultivate international talents who have a good understanding of China, understand the mainstream values of Chinese society, have corresponding Chinese language skills, have certain cross-cultural and global competencies, and have considerable professional knowledge and academic abilities in their disciplines.

2．应具有核科学与技术学科宽广而扎实的基础理论和系统深入的专门知识，深入了解本学科的发展方向及学术研究前沿。具有独立地和创造性地从事科学研究工作的能力，初步具有主持较大型科研、技术开发项目，或探索解决经济、社会发展问题的能力。

2. Cultivate students to master solid and broad basic theories along with in-depth and systematic knowledge of Nuclear Science and Technology, to understand the development direction of the discipline and the forefront of academic research. Equip students with the ability to engage in scientific research independently and creatively, and have the primary ability to preside over large-scale scientific research and technological development projects, or to explore and solve the problems of China's economic and social development.

三、研究方向

III. Research Direction

核科学与技术是一门由基础科学、技术科学及工程科学组成的综合性很强的尖端学科。本学科主要研究核能科学与工程、核燃料循环与材料、核技术及应用、辐射防护及环境保护。本学科点下设的主要研究方向为：

Nuclear Science and Technology is a comprehensive and advanced discipline composed of basic science, technical science and engineering science. The discipline focuses on nuclear science and engineering, nuclear fuel cycle and materials, nuclear technologies and applications, radiation protection, and environmental protection. The main research directions under this discipline are as follows:

1．核反应堆结构与设备

1． Structure and Equipment of Nuclear Reactors

2．核反应堆热工水力学

2．Thermal Hydraulics of Nuclear Reactors

3．核反应堆物理与屏蔽

3．Physics and Shielding of Nuclear Reactors

4．核电厂安全分析

4．Safety Analysis of Nuclear Power Plant

5．核电厂控制与仪表

5．Control and Instrumentation of Nuclear Power Plant

6．核反应堆材料

6．Materials for Nuclear Reactors

7．核技术及应用

7．Nuclear Technology and Applications

8．辐射防护与环境工程

8．Radiation Protection and Environmental Engineering

四、培养方式

IV. Training Method

1．硕士生的培养方式为导师负责制，导师是研究生培养第一责任人，要了解掌握研究生的具体状况，将专业教育与日常教育有机融合，既作学业导师，又作人生导师，严格要求学生遵守科学道德和学术规范。提倡按二级学科组成导师指导小组集体培养。对跨学科或交叉学科以及与有关研究部门、企业联合培养研究生时，应从相关学科及有关单位中聘请具有高级职称的有关人员进入导师指导小组协助指导。导师指导小组要负责审查研究生的文献综述与选题报告、论文中期检查以及论文预答辩等培养环节的工作完成情况。

1. The training of postgraduates implements supervisor responsibility system, the supervisor is the person of primary responsibility for postgraduate training. The supervisor shall understand and master the specific condition of postgraduates and organically integrate professional education with daily education both as academic mentors and life mentors. The supervisor should also

strictly require students to abide by scientific ethics and academic norms. Advocate composing the supervisor steering group for collective cultivation according to the second-level disciplines. For interdisciplinary or cross-disciplinary training or training in conjunction with relevant research departments and enterprises, relevant personnel with senior professional titles shall be recruited from relevant disciplines and relevant units to assist in supervisor steering groups. The supervisor steering group is responsible to inspect the postgraduates' completion status of the literature review and thesis proposal, mid-term review and pre-defense of dissertation.

2．导师应根据培养方案的要求，多方面了解所指导的硕士生的知识结构、学术特长、研究兴趣、能力基础等具体情况，据此制定出研究生个人培养计划，并督促检查其实施情况。

2. The supervisor should acknowledge the knowledge structure, academic skills, research interests, and abilities of the postgraduates according to the requirement of the training scheme, based on which to formulate a training plan for individual postgraduate and supervise the implementation according to the plan.

3．硕士研究生的培养采用课程学习与科学研究并重的方式。既要使硕士生掌握坚实的基础理论和系统的专业知识，又要培养研究生掌握科学研究或独立担负设计、管理等方面工作的能力。

3. The training of postgraduates adopts the way of attaching equal importance to course learning and scientific research. It is necessary to make postgraduates master solid basic theory and systematic professional knowledge and cultivate postgraduates' ability to undertake scientific research or design and management work independently.

4．导师应指导研究生学习有关课程，指导学位论文选题，检查科学研究进展情况，帮助解决科研中的困难，适时地指导研究生撰写论文，认真审阅学位论文，切实把好研究生的培养质量关。

4. The supervisor should guide postgraduates to study relevant courses, guide the topic selection of the degree thesis, check the progress of scientific research, help them solve the difficulties in scientific research, timely guide postgraduates to write the thesis, carefully review the degree thesis, and ensure the training quality of postgraduates.

五、学制与学习年限

V. Educational System and Duration of the Program

学制 3 年，学习年限 2-4 年。

The educational system is 3 years, and the duration of the program is 2-4 years.

六、课程设置与学分要求

VI. Curriculum and Credit Requirements

硕士生的课程学习实行学分制。要求各学科硕士生应修满的学分数为：总学分应不少于28 学分，其中学位课不少于 22 学分。课程体系框架如下：

The course study of postgraduates implements credit system. The required credits for postgraduates in all disciplines: no less than 28 credits in total, including no less than 22 credits for degree courses. The curriculum framework is as follows:

1．学位课（不少于 **22** 学分），其中：

1．Degree courses (no less than 22 credits), of which:

(1) 公共课：10 学分

(1) Public courses: 10 credits

汉语综合(1)：4 学分(64 学时)

Chinese Comprehension (1): 4 credits (64 class hours);

汉语综合(2)：4 学分(64 学时)

Chinese Comprehension (2): 4 credits (64 class hours);

中国概况(英文)：2 学分(32 学时)

Introduction to China (English): 2 credits (32 class hours);

(2) 数学基础课或基础理论课：不少于二门课程，4 学分。

(2) Basic mathematics courses or basic theoretical courses: No less than 2 courses, 4 credits.

(3) 学科基础课：按一级学科设置，不少于 4 学分。

(3) Basic courses of disciplines: Set up according to the first-level discipline, no less than 4 credits.

(4) 学科专业课：按一级或二级学科设置，不少于 4 学分。

(4) Specialized courses of disciplines: Set up according to the first-level or second-level discipline, no less than 4 credits.

2．必修课程与必修环节（**6** 学分），其中：

2．Compulsory courses and required links (6 credits), of which:

(1) 研究生科学道德与学术规范：1 学分。

(1) Scientific Ethics and Academic Norms for Postgraduates: 1 credit.

(2) 专题课程/seminar 课程：1 学分

(2) Program Course/Seminar Course: 1 credit

专题课程/seminar 课程结合本领域学术前沿和研究生学位论文的选题进行设置。课程可采用教师讲授与研究生研讨相结合的方法进行学习。

Program course/seminar course shall be set up in combination with the academic frontiers in this field and the topic of master dissertation. The courses can be conducted by the combination of professor teaching with postgraduate discussion.

专题课程在研究生学位论文阶段完成。

The program course should be completed in the process of master dissertation.

(3) 实践环节：1 学分

(3) Practice Links: 1 credit.

实践环节包括实验教学、专业生产实践以及教学实践等。在第二、第三学期各院（系）及导师应安排研究生参加实践，如讲授大学本科课程的部分章节，参与指导课程设计、实习、实验、辅导答疑、课堂讨论等教学环节，或结合科研课题到生产单位参加调研或项目研发等实践工作，总工作量应达到 80 学时或 10 个工作日。

The practice links include experimental teaching, professional production practice and teaching practice, etc. In the second and third semesters, schools (departments) and supervisors shall arrange postgraduates to participate in practice. For example, teach some chapters of undergraduate courses, guide curriculum design, take an internship, do experiments, supervise and answer questions, and participate in classroom discussion and other teaching links, or participate in practical work such as research or project research and development in the production unit in combination with scientific research tasks. The total workload shall reach 80 class hours or 10 working days.

学院根据各学科特点和人才培养目标，依托本学科重点实验室、实践教学基地等开设具有特定主题的系列实验课或以实验为主的专题课；或与学科应用技术相关的硬件、软件设计或系统设计；或在本学科重点实验室、实践教学基地等进行工程设计、实验设备安装调试或协助实验室教师指导本科生完成实验教学等实验工作，以提高研究生的科研实践能力。

The school shall set up a series of experimental courses or experiment-based seminars with specific topics according to the characteristics of each discipline and the goal of personnel training and relying on the key laboratories and practical teaching bases of the discipline; or set up hardware and software design or system design related to the applied technologies of the discipline; or carry out engineering design, installation and debugging of experimental equipment in key laboratories and practical teaching bases of this discipline, or assist laboratory teachers to guide undergraduates to complete experimental teaching, so as to improve the practical ability of postgraduates in scientific research.

(4) 学术活动：1 学分，要求硕士生至少参加 6 次学术报告。

(4) Academic Activities: 1 credit, postgraduates are required to participate in at least 6 academic reports.

(5) 文献综述与开题报告：1 学分。

(5) Literature Review and Thesis Proposal: 1 credit.

(6) 论文中期检查：1 学分。

(6) Mid-term Review of the Thesis: 1 credit.

3．非学位选修课：

3．Non-degree optional courses:

学生根据本人情况，可选修其他学科专业课和研究生课程目录上的课程，使总学分不少于 28 学分。

Postgraduates can take specialized courses of other disciplines and courses in the catalogue of postgraduate courses according to their own situation, and the total credits shall not be less than 28 credits.

学士阶段非本学科的硕士生应补修由导师指定的若干本学科学士阶段主干课程。补修课程不计入总学分。

Postgraduates who are not in their own disciplines at the bachelor stage should take several major courses of bachelor stage of the disciplines designated by their supervisors. Supplementary courses are not included in the total credit.

具体课程设置见附表。

For the specific curriculum, please refer to the Schedule.

七、科学研究与学位论文要求

VII. Requirements for Scientific Research and Degree Thesis

科学研究与学位论文工作是研究生培养的重要组成部分，是培养硕士研究生独立思考、勇于创新的精神和从事科学研究或担负专门技术工作能力的重要手段。硕士研究生应在导师指导下独立完成硕士学位论文工作。

Scientific research and degree thesis are important parts of postgraduate training, and important ways to cultivate postgraduates' independent thinking, innovative spirit and the ability to undertake scientific research or specialized technical work. Postgraduates should independently complete the master dissertation under the guidance of their supervisors.

1.文献综述与开题报告

1. Literature review and thesis proposal

硕士生入学后应在导师指导下，查阅文献资料，了解学科现状和动态，尽早确定课题方向，完成论文选题。学位论文的选题一般应结合本学科的研究方向和科研项目，鼓励面向国民经济和社会发展的需要选择应用型课题。确定学位论文工作的内容和工作量时应全面考虑

硕士研究生的知识结构、工作能力和培养年限等方面的特点。

After the enrollment, postgraduates should consult the literature, understand the current situation and trends of the discipline, determine the research direction as soon as possible, and complete the topic selection of the degree thesis under the guidance of their supervisors. The topic selection of degree thesis should generally be combined with the research direction and scientific research projects of this discipline, and the selection of applied topics meeting the needs of national economic and social development is encouraged. When determining the content and workload of the degree thesis work, the supervisor should fully consider the knowledge structure, work abilities and training duration of postgraduates.

文献综述与开题报告，包括的主要内容：课题来源及研究背景和意义；国内外在该方向的研究和发展情况及分析；论文的主要研究内容；研究方案及进度安排，预期达到的目标；为完成课题已具备和所需的条件和经费；预计研究过程中可能遇到的困难和问题以及解决的措施；主要参考文献等。

The main contents of the literature review and thesis proposal include: origin of the topic and the research background and significance; the research in this direction at home and abroad and the development situation analysis; the main research contents of the thesis; the research program and schedule, and the expected goals; the available conditions and required funds for the completion of the research task; the difficulties and problems that may be encountered in the research process and the measures to be taken to solve them; the main references and so on.

硕士开题由学院统一组织。全日制学术型硕士研究生的开题时间一般安排在硕士生入学后第 2 学期的期末前进行。学位论文开题不合格者，不得进入课题研究，但可以在一个月后重新开题。学位论文研究中途改题者，必须重新开题并通过评审。凡重新开题而未通过评审者，终止对其培养。

The master thesis proposal is uniformly organized by the school. For full-time academic postgraduates, the time for submitting thesis proposal is generally arranged before the end of the second semester after admission. Those who fail in the thesis proposal shall not begin topic research, but submit a new thesis proposal in a month. Those who change the topic in the middle of the research must submit a new thesis proposal and pass the evaluation. For those who submit a new thesis proposal and fail to pass the evaluation, their training shall be terminated.

对文献综述与开题报告工作的具体要求见《华北电力大学学术学位硕士研究生必修环节实施细则》。

For the specific requirements of literature review and thesis proposal, please refer to the Detailed Rules for the Implementation of Required Links for Postgraduates with Academic Degrees in North China Electric Power University.

2.论文中期检查

2. Mid-term review of the thesis

硕士研究生的学位论文中期检查一般在第四学期末完成，其中申请 2 年毕业的研究生要求在第三学期末完成。中期检查的主要内容为：论文工作是否按开题报告预定的内容及进度进行；已完成的研究内容及结果；目前存在的或预期可能会出现的问题；论文按时完成的可能性等。对学位论文工作中期检查的具体要求见《华北电力大学硕士研究生必修环节实施细则》。

The mid-term review of master dissertation is usually completed at the end of the fourth semester, and postgraduates applying for graduation after two-year study are required to complete it at the end of the third semester. The main contents of the mid-term review: whether the thesis work is consistent with the contents and schedule of the thesis proposal; the completed research contents and results; the existing or expected problems; the possibility of completing the dissertation on time. For the specific requirements for the mid-term review of degree thesis work, refer to the Detailed Rules for the Implementation of Required Links for Postgraduates in North China Electric Power University.

论文中期检查通过者给予 1 学分。

Those who pass the mid-term review of the dissertation shall be given 1 credit.

3．学术论文发表与科研成果要求

3．Requirements of academic papers and research achievements

学术学位硕士生在学期间应积极参加本学科的国内外学术交流活动，鼓励其公开发表学术论文。

During their school period, academic degree postgraduates shall actively participate in the academic exchange activities at home and abroad, and be encouraged to publish their academic papers.

4．学位论文要求

4．Degree thesis requirements

硕士学位论文是硕士生科学研究工作的全面总结，是描述其研究成果、反映其研究水平的重要学术文献资料，是申请和授予硕士学位的基本依据。学位论文撰写是硕士生培养过程的基本训练之一，必须按照规范认真执行，具体要求见《华北电力大学学术硕士学位论文撰写规范及范例》。鼓励和支持留学生使用中文撰写学位论文。全英文培养的留学生，学位论文可以使用英文撰写,论文摘要应为中文。

Master dissertation is a comprehensive summary of postgraduates' scientific research work, is an important academic literature that describes their research results and reflects their research level, and is the basis for applying for and awarding master's degrees. Degree thesis writing is one of the basic training in the training process of postgraduates, which must be carried out conscientiously in accordance with the norms. For specific requirements, please refer to *Norms and Examples for the Writing of Academic Master Dissertation in North China Electric Power Universit*y. International students are encouraged to write their dissertations in Chinese. For international students trained in English, their dissertations can be written in English, but the abstract shall be in Chinese.

5．学位论文评审与答辩

5．Review and defense of degree thesis

学校集中进行硕士研究生论文的评审与答辩工作。研究生在论文工作完成后，须向所在院系提交论文答辩申请，相关部门要对研究生的答辩资格进行审查，审查通过方可进入论文评审与答辩程序。未通过答辩资格审查的硕士生不得进行论文答辩。

The review and defense of master dissertation shall be conducted in an intensive manner. Postgraduates should submit the application for thesis defense to their departments after the completion of the thesis work, and the relevant departments shall examine the postgraduates' defense qualification and they are allowed to enter the thesis review and defense procedure only after they pass the examination. Postgraduates who fail to pass the examination of their qualification for defense shall not defense to their theses.

硕士学位论文的评审与答辩按照《华北电力大学研究生学位论文评审和答辩的有关规定》、《华北电力大学学位授予工作细则》等相关规定进行。毕业生的答辩时间一般安排在 6 月，延期毕业和提前毕业的研究生的答辩时间一般安排在 6 月或 12 月。

The review and defense of master's dissertation shall be carried out in accordance with the Relevant Provisions on the Review and Defense of Master Dissertation of North China Electric Power University and the Detailed Rules of Degree Awarding of North China Electric Power University. The defense time for postgraduates is generally arranged in June, while that for postgraduates of postponed graduation and early graduation is generally arranged in June or December.

八、提前毕业条件

VIII. Conditions for Early Graduation

特别优秀并提前完成本培养方案规定内容的硕士生最多可提前 1 年毕业。提前毕业的全日制学术型硕士研究生要求在第二学期前八周完成文献综述与开题报告；在第三学期的末完

成中期检查；论文答辩资格审查前，须以第一作者（如为第二作者，导师须为第一作者）至少公开发表（或接收）本领域顶级期刊（附目录）1 篇。其课程学分、文献综述与开题报告、中期检查、学位论文评审与答辩等培养环节的质量要求与 3 年毕业研究生相同。

Doctoral students who are particularly excellent and complete the contents specified in the training program ahead of time can graduate at most one year in advance. Full-time academic postgraduates applying for early graduation are required to complete the literature review and thesis proposal before the eighth weeks of the second semester and complete the mid-term review at the end of the third semester; publish (or receive) at least 1 paper in the top journals (with catalog) of their fields in the name of the first author (or the second author, with the supervisor being the first author). The quality requirements of course credits, literature review and thesis proposal, mid-term review, dissertation review and defense and other training process are the same as those taking the 3-year training program.

附表：核科学与技术一级学科学术学位硕士研究生培养方案（留学生）课程设置表（英语授课）

Schedule:Curriculum (Taught in English) of Training Program for Postgraduates (International Student) in First-level Discipline of Nuclear Science and Technology

类别 Category		课程名称 Course name	学时 Class hour	学分 Credit	考核方式 Assessment mode	开课学期 Semester of the course	备注 Remarks
学位课(不少于 22 学分) Degree courses (no less than 22 credits)	公共课（10 学分） Public courses (10 credits)	汉语综合（1） Chinese Comprehension (1)	64	4	考试 Exam	1	
		中国概况(英文) Introduction to China (English)	32	2	考试 Exam	1	
		汉语综合（2） Chinese Comprehension (2)	64	4	考试 Exam	2	
	基础理论课 Basic theoretical courses	矩阵论 Matrix Theory	32	2	考试 Exam	1	
		数值分析 Numerical Analysis	32	2	考试 Exam	1	
	学科基础课 Basic courses of disciplines	传热学 Heat Transfer	48	3	考试 Exam	1	
		流体力学 Fluid Mechanics	48	3	考试 Exam	1	
		核电厂系统 Nuclear Power Plant System	64	4	考试 Exam	1	
	学科专业课 Specialized courses of disciplines	核材料 Nuclear Material	48	3	考试 Exam	**2**	
		核反应堆热工水力学 Thermal Hydraulics of Nuclear Reactors	48	3	考试 Exam	2	
		高等核反应堆物理分析 Physical Analysis of Advanced Nuclear Reactors	48	3	考试 Exam	2	
		原子核物理概论 Introduction to Nuclear Physics	32	2	考试 Exam	3	
		核电站仪表与控制 Instrumentation and Control of Nuclear Power Plant	48	3	考试 Exam	3	
		高等核反应堆安全分析 Safety Analysis of Advanced Nuclear Reactors	48	3	考试 Exam	3	
非学位课 Non-degree courses	必修课程与必修环节(6 学分) Compulsory courses and required links (6 credits)	研究生科学道德与学术规范 Scientific Ethics and Academic Norms for Postgraduates		1	考查 Review of performance		
		专题课程/seminar 课程 Program Course/Seminar Course		1	考查 Review of performance		

		实践环节（实验、实践） Practice Links (Experiment, Practice)		1	考查 Review of performance		
		学术活动 Academic Activities		1	考查 Review of performance		
		文献综述与选题报告 Literature Review and Thesis Proposal		1	考查 Review of performance		
		论文中期检查 Mid-term Review of the Thesis		1	考查 Review of performance		