华北电力大学（留学生）英语授课

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

材料科学与工程一级学科硕士研究生培养方案

Training Program for Postgraduates in First-level Discipline of Materials Science and Engineering

（学科代码：0805　　授予工学硕士学位）

(Discipline Code: 0805, Degree: Master Degree of Engineering)

一、学科简介

I. Brief Introduction to the Discipline

华北电力大学材料科学与工程学科建立于 2002 年，建立之后，学科发展一直注重发展能源电力特色，致力于为能源电力行业培养高素质的专业人才。2002 年，作为全国电力行业院校的第一家材料科学与工程专业，面向全国首次招收材 料科学与工程专业的本科生；2006 年，获得材料学硕士点学位授予权，并于 2007 年开始招生；2011 年，建立新能源材料与器件本科专业；2012 年，获得 材料科学与工程一级学科硕士点授予权；是学校“能源电力科学与工程“双一流” 学科重要组成部分，已进入 ESI 世界前 1%行列。

Since the discipline of Materials Science and Engineering of North China Electric Power University established in 2002, it has been paying attention to the development of energy and power characteristics, and is committed to training high-quality professionals for the energy and power industry. In 2002, as the first major of Materials Science and Engineering in colleges and universities of the electric power industry, it enrolled undergraduates nationwide majoring in Materials Science and Engineering for the first time; in 2006, it was authorized to award master's degrees in Materials Science, and in 2007, it began to enroll students of this major; in 2011, it established an undergraduate major of New Energy Materials and Devices; in 2012, it was authorized to award master's degrees in the first-level discipline of Materials Science and Engineering. It is an important part of the university's "double first-class" disciplines of energy and power science and engineering, and has ranked top 1% of the world in ESI.

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．掌握材料科学与工程领域内坚实的基础理论和系统的专门知识，了解本学科的前沿发展现状和趋势。具有创新意识和独立从事科学研究的能力或独立承担专门技术工作的能力。较熟练地掌握一门外国语，能够应用该外国语阅读本专业的文献资料。

2. Master solid basic theories and systematic specialized knowledge in the field of Materials Science and Engineering, and understand the current situation and trend of the cutting-edge development of this discipline. Have the consciousness of innovation and the ability to engage in scientific research independently or undertake specialized technical work independently. Be proficient in a foreign language and use it to read the literature of this major.

三、研究方向

III. Research Direction

材料科学与工程是关于材料组成与结构、制备与加工、材料性质及使用性能 诸要素和它们之间相互关系的科学，是一门多学科交叉的综合性学科，下设材料 物理与化学、材料学和材料加工工程三个二级学科。学科研究方向包括：

As an interdisciplinary and comprehensive discipline, Materials Science and Engineering is a science about material composition and structure, preparation and processing, material properties and performance, and their interrelations, it has three second-level disciplines: Materials Physics and Chemistry, Materials Science and Materials Processing Engineering. The research directions of the discipline include:

1. 高温材料性能与寿命

1. Properties and Service Life of High Temperature Materials

2. 电厂材料的磨损、腐蚀与防护

2. Wear, Corrosion and Protection of Materials in Power Plants

3. 先进金属材料

3. Advanced Metal Materials

4. 电磁功能材料

4. Electromagnetic Functional Materials

5. 电工新材料

5. New Electrical Engineering Materials

6. 新能源材料与器件

6. New Energy Materials and Devices

7. 纳米材料与纳米技术

7. Nanomaterials and Nanotechnology

8. 光伏材料与器件

8. Photovoltaic Materials and Devices

9. 激光熔覆与加工技术

9. Laser Cladding and Processing Technology

10. 微纳米表面工程

10. Micro-nano Surface 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思想状况，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 ideological situation 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. It is advocated to form a supervisor steering group for collective cultivation according to the second-level discipline. 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 student's 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 shall acknowledge the knowledge structure, academic skills, research interests, and abilities of the master candidates according to the requirement of the training program, based on which to formulate a training plan for individual graduate student 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 shall 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 32 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 32 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，其中：

(1) Public courses: 10 credits, including:

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 postgraduate 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 32 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 32 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's degree thesis 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 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.

硕士开题由院系统一组织。全日制学术型硕士研究生文献综述与开题报告会一般要求在第二学期末前完成，开题时间距离申请答辩日期一般不少于一学年。

The thesis proposal is uniformly organized by the school or department. The literature review and thesis proposal of full-time academic postgraduates is generally required to be completed at the end of the second semester, and the time for submitting thesis proposal is at least one academic year before the thesis defense.

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

学位论文实行中期检查制度。全日制学术型硕士研究生的学位论文中期检查一般在第四学期末完成，2 年毕业的全日制学术型研究生要求在第四学期的前三周内完成。按专业方向组织考核小组（3-5 人组成）对研究生的论文工作进展以及工作态度、论文完成的可能性等进行全方位的考查。

A mid-term review system is adopted for degree thesis. The mid-term review of full-time academic postgraduate dissertation is usually completed at the end of the fourth semester, and full-time academic postgraduates applying for graduation after two-year study are required to complete it within the first three weeks of the fourth semester. Organize an assessment team (composed of 3-5 members) according to majors to conduct an all-round review of the progress of the dissertation work of the postgraduate students, their work attitude and the possibility of completing the dissertation.

3．科研成果要求

3. Requirements for scientific research achievements

鼓励留学生公开发表与研究工作相关的学术论文。

International students are encouraged to publish academic papers related to their research work.

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》。

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. Dissertation 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 Master Dissertation Writing of North China Electric Power University.

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 degree thesis 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 graduates 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

硕士研究生学业优秀者可以申请 2 年毕业，必须符合以下条件：

Particularly outstanding postgraduates can apply for graduation after 2 years of study on the basis of meeting the following conditions:

正式发表 SCI 期刊（不含开源期刊）或一级学报论文 2 篇。国际或国内一级学会大会优秀论文奖论文，或研究生的学位论文工作成果（署名华北电力大学） 获得省部级三等及以上奖励一项，本人排在前 5 名，或获得国内外发明专利 1 项，至多相当于前述论文 1 篇。

They have officially published 2 papers in SCI journals (not including open access journals) or first-class journals. The thesis is granted with Excellent Thesis Award of first-class international or domestic association conference, or the work achievements of master dissertation (with North China Electric Power University as the author affiliation) win a provincial-and-ministerial-level third-class or above award (the postgraduate is in the top 5), or the postgraduate obtains a patent for invention at home and abroad, which can be equivalent to at most one of the above-mentioned theses.

附表：材料科学与工程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 Materials Science and Engineering

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)	(10 学分) (10 credits) 公共课 Public courses	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	
	(不少于 4 学分) (No less than 4 credits) 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	
	(不少于 8 学分) (No less than 8 credits) 学科基础课和学科专业课 Basic courses and specialized courses of disciplines	专业英语 Specialty English	16	1	考试 Exam	2	
		合金热力学 Alloy Thermodynamics	32	2	考试 Exam	1	
		材料分析方法 Material Analysis Method	32	2	考试 Exam	1	
		功能材料的缺陷化学 Defect Chemistry of Functional Materials	32	2	考试 Exam	1	
		现代表面工程 Modern Surface Engineering	32	2	考试 Exam	2	
		高等材料力学 Advanced Material Mechanics	32	2	考试 Exam	1	
		材料凝固与连接 Material Solidification and Bonding	32	2	考试 Exam	2	
		功能材料 Functional Materials	32	2	考试 Exam	2	
		无机材料合成 Inorganic Material Synthesis	32	2	考试 Exam	2	

		磁性材料分析 Magnetic Material Analysis	32	2	考试 Exam	2	
		计算材料学 Computational Materials Science	32	2	考试 Exam	2	
		太阳电池光伏发电及其应用 Solar Cell Photovoltaic Power Generation and Its Application	32	2	考试 Exam	2	
		薄膜技术与薄膜材料 Thin Film Technology and Thin Film Materials	32	2	考试 Exam	2	
		半导体物理 Semiconductor Physics	32	2	考试 Exam	2	
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	1	
		专题课程/seminar 课程 Program Course/Seminar Course	16	1	考查 Review of performance	2	
		实践环节（实验、实践） Practice Links (Experiment, Practice)		1	考查 Review of performance	答辩前 Before thesis defense	
		学术活动 Academic Activities		1	考查 Review of performance	答辩前 Before thesis defense	
		文献综述与选题报告 Literature Review and Thesis Proposal		1	考查 Review of performance	2	
		论文中期检查 Mid-term Review of the Thesis		1	考查 Review of performance	4	
	选修课 Optional courses	科技信息检索与论文写作专题讲座 Symposium on Sci-tech Information Search and Thesis Writing	16	1	考查 Review of performance	1	
		科学精神与科学研究方法 Scientific Spirit and Scientific Research Methods	16	1	考试 Exam	1	
		选修课门数及课程根据招生规模及社会需求设置（如有确定开设的，可列出） The optional courses and their numbers will be determined according to the enrollment scale and social needs (the determined ones can be listed).					
补修课 Supplementary courses		材料科学基础 Fundamentals of Materials Science					