**(080800)电气工程学科2020级全日制直博生培养方案**

2020 Full-time Doctoral after Bachelor's Program for Electrical Engineering

**一、基本信息** Basic Information

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| **院系名称**School | 电子信息与电气工程学院（电气系）School of Electronic Information and Electrical EngineeringDepartment of Electrical Engineering | **适用年级**Grade | 2020 级Class |
| **适用专业**Major | 电气工程Electrical Engineering | **标准学制**Duration | 5年Years |
| **学习形式**Study Mode | 全日制 Full time |
| **项目类型**Program Type | 学术型Academic |
| **培养层次**Program Level | 直博生 Doctoral after Bachelor's |
| **最低学分**Min Credit | 35 | **最低GPA学分**Min GPA Credit | 20 | **最低GPA**Min GPA | 2.7 |

**二、学科简介** Introduction

本学科始建于1908年，是上海交通大学历史最悠久的学科之一。1962年起下属五个二级学科陆续获得硕士学位授予权，在全国相应学科中均为首批有权授予硕士学位的学科。1999年设立电气工程学科博士后流动站。2000年电气工程获得一级学科博士学位授予权，培养电气工程学科的工学博士。本一级学科下属的电力系统及其自动化，电机与电器，高电压及绝缘技术，电力电子与电力传动和电工理论与新技术五个二级学科均开设了博士研究生课程，实行在一级学科范围内选课。

本学科研究与科技创新水平不断提高，拥有一系列重点科研与教育基地，包括“国家能源智能电网(上海)研发中心”，“国家能源海上风电技术装备研发中心”，“电力传输与功率变换控制教育部重点实验室”，“电气绝缘与热老化上海市重点实验室”，“国家工科基础课程电工电子教学基地”，“上海交通大学风力发电研究中心”和“上海交通大学泛在电力物联网智能感知实验室”等。

本学科与美国佐治亚理工、欧盟的意大利都灵理工大学和德国达姆施塔特技术大学开展了联合培养研究生的项目。毕业生主要分布在电力工程设计、电力电网、电气设备设计及制造、新能源等领域。

This discipline was founded in 1908, and is one of the oldest disciplines in Shanghai Jiao Tong University. Since 1962, 5 level-2 disciplines have successively had the right to confer a master’s degree, and have been listed into the first group of disciplines with the right to confer a master’s degree among national disciplines. A mobile post-doctoral station for electrical engineering was established in 1999. The electrical engineering discipline had the right to confer a doctoral level for level-1 discipline for the purpose of cultivating doctors majoring in electrical engineering in 2000. 5 level-2 disciplines classified into level-1 disciplines (including Power System and Automation, Electric Machines and Electric Apparatus, High Voltage and Insulation Technology, Power Electronics and Electrical Drives, and Theory and New Technology of Electrical Engineering) have opened doctoral student courses, and are selected within the scope of level-1 disciplines.

It also has research centers and labs such as “State Energy Smart Grid R&D Center”, “State Energy Offshore Wind Technology and Equipment R&D Center”, “Power Transmission Conversion and Control Key Lab of MOE”, “Electric Insulation and Thermal Aging Key Laboratory of Shanghai”, “Electric and Electronic Teaching Base of National Basic Science Courses”, “Wind Power Research Center” and “Ubiquitous Power IoT Intelligent Perception Lab”.

This discipline is now carrying out a joint program for training postgraduates with Georgia Institute of Technology of America, Turin Polytechnic University in EU, and Darmstadt Technical University of Germany. The postgraduates of this discipline are mainly distributed to the fields such as electric power engineering design, electric power and electric network, design and manufacture of electrical equipment, and new energy resources.

**三、培养目标** Program Objective

博士学位获得者应能系统性地掌握电气学科坚实宽广的基础理论知识，深入了解学科的进展、动向和最新发展前沿。具有独立从事科学研究的能力，并在本学科领域取得理论或实践上的创造性研究成果。能熟练阅读本专业的外文资料，具有一定的写作能力和进行国际学术交流的能力。能胜任高等院校教学、科学研究、工程技术或科技管理等工作。

The doctoral degree holders can systematically master firm and broad basic theoretical knowledge of the electrical discipline and deeply know the progress, trends and latest development of this discipline. They have the ability to undertake scientific research and obtain creative research results in theory and practice. They can skillfully read foreign language materials of this major, and possess certain writing ability and international academic communication skills. They can be qualified for teaching in the colleges and universities, scientific research, engineering technology or technology management and other work.

**四、培养方式及学习年限 Training Mode and Study Duration**

本项目采用全日制学习、导师制培养模式；新生入学后两周内经师生互选确定导师。直博生学习年限一般为5年，最长（含休学）不得超过7年。

Students pursue their studies in a full-time study load with supervisors’ instruction. Supervisors and students could choose each other within the first 2 weeks after freshmen registration. The study duration for doctoral after bachelor's student is usually 5 years, no longer than 7 years (including suspension of schooling）in maximum.

**五、课程学习要求** Course Requirement

总学分≥35，GPA统计源硕士生课程学分≥20。总学分内，数学类课程不低于6学分，专业前沿课与专业选修课各不低于3学分。GPA统计源硕士生课程学分内，包含学术英语2学分，专业基础课（不含数学类）不低于6学分，数学类课程不低于3学分。

The total credits are no less than 35, and the GPA statistical source master's course credits are no less than 20. Within the total learning credits, mathematics courses shall be no less than 6 credits, professional frontier courses and professional elective courses shall be no less than 3 credits respectively. The GPA statistics source master's course credits include academic English (2 credits), professional basic courses (mathematics excluded) no less than 6 credits and mathematics courses no less than 3 credits.

课程学习原则上要求在2年内完成。各类课程具体要求如下：

The courses should be completed within the first 2 academic years. The specific requirements are as follows:

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| **课程类别****Course Type** | **学分要求****Min Credits** | **门数要求****Min Courses** | **GPA 学分要求****Min GPA Credit** | **备注****Note** |
| 公共基础课General Courses |  |  |  |  |
| 专业基础课Program Core Courses |  |  |  |  |
| 专业前沿课Program Frontier Courses | ≥3 |  |  |  |
| 专业选修课Program Elective Courses | ≥3 |  |  |  |
| 任意选修课Elective Courses |  |  |  | 非必需Not required |

电气工程研究生学术报告会和讨论会要求：

1、学术报告会或讨论会，在个人培养计划中选在第二学期，全年都可以参加，入学第一年内完成。

2、参会后需提交由电气系举办的学术报告会记录表，硕士生要求提交8场学术报告会的记录表，每场总结不少于800字。电院相关学科的学术报告会也可参加，但不能超过总数的三分之一。

 3、所有选课学生于每年夏季学期第一周周三前以班级为单位，班长按二级学科方向分好收齐后将学术报告电子版反馈到教学秘书邮箱。每位学生的文件电子版反馈命名为：二级学科方向名称+姓名+学号，电气工程系五个二级学科方向为：电力系统、电力电子、电机、高压、电工中心。

电院报告会通知见网站http://www.seiee.sjtu.edu.cn/seiee/list/683-1-20.htm

电气系学术动态见网站<https://eei.sjtu.edu.cn/news.aspx?info_lb=498&flag=498>

Academic speech and seminar requirements:

1. Academic speech and seminar should be selected in the 2nd semester and can be participated in the whole year. They should be completed within the first academic year.
2. Postgraduate should submit at least 8 record forms after attending the academic speeches organized by the Department of Electrical Engineering. Each record form should include more than 800 words. The relevant subjects academic speeches organized by the Institute can also be participated, but they cannot exceed 1/3 of the total.
3. All the postgraduates should submit the e-edition record form to their class leader before 1st Wednesday of the summer semester. Class leaders should classify the forms according to level-2 disciplines and send them to the teaching secretary.

Record form naming rules: level-2 disciplines name + postgraduates name + postgraduates ID

Level-2 disciplines names: Power System and Automation, Electric Machines and Electric Apparatus, High Voltage and Insulation Technology, Power Electronics and Electrical Drives, and Theory and New Technology of Electrical Engineering

Institute academic trends: <http://www.seiee.sjtu.edu.cn/seiee/list/683-1-20.htm>

Department academic trends: <https://eei.sjtu.edu.cn/news.aspx?info_lb=498&flag=498>

**六、培养过程要求** Training Requirement

直博生的资格考试原则上应在入学后第二学年第二学期内完成，直博生的前两年课程学习的GPA应≥2.7；

Doctoral after Bachelor's students should finish the qualification exam in the 4th semester with GPA≥2.7 in the first two years.

博士生学位论文开题工作应该在通过资格考试后，直博生一般应该在第三学年第一学期结束前完成；

Doctoral after Bachelor's dissertation proposal should be started after passing the qualification exam and finished before the end of the 5th semester.

**七、学术成果要求** Requirement on Academic Achievements

（1）攻读博士学位的研究生，在申请学位论文答辩前，在SCI（科学引文索引）或EI（工程索引）检索源期刊上发表（或录用）与学位论文主要内容相关的学术论文两篇以上（含），其中至少有一篇外文论文在SCI检索的外文期刊上发表（或录用）（不包括大学学报的英文版和Lecture Notes，不包括WSEAS）。

（2）博士研究生在学期间取得的科研成果可等同学术论文的发表。获得国家级科技成果奖，可免除论文发表的要求；获得省部级科技成果一等奖（署名前5位）、二等奖（署名前3位）、三等奖（署名前2位）、或发明专利授权，等同于发表相同数量的SCI或EI论文；获得省部级其它科技成果奖项或发明专利公开，等同发表相同数量的学术论文。

（3）博士生所发表的学术论文必须在就读博士期间，以上海交通大学为第一单位发表（或录用）。学位申请人为第一作者发表的论文以1篇计；以第二作者发表的论文（第一作者必须是其导师）以1/2篇计；第三作者及以后者不计。博士生在硕士生期间发表的论文不计入其博士生学习阶段的论文发表数。

（4）电气工程学科欢迎并支持导师根据实际情况对其指导的学生制定更高标准。

(1) A postgraduate who applies for a doctorate shall publish two or more academic papers (or his/her papers have been accepted) relating to main contents of his/her paper in SCI (science citation index) or EI (engineering index), of which at least one foreign paper has been published or accepted in SCI based foreign periodicals (excluding English version of university journals, lecture notes and WSEAS) before applying for doctoral paper defense.

(2) Scientific achievements obtained by a doctor during his/her study may be published as an academic paper. If a doctor has won the national science and technology achievement award, he/she may be exempted from publishing paper(s); if a doctor has won the first prize for provincial science and technology achievement (top 5), second prize (top 3) and third prize (top 2) or invention patent authorization, it will be deemed that the same number of SCI or EI papers have been published; if a doctor has won other provincial and ministerial-level science and technology achievement awards or invention patents, it will be deemed that the same number of academic papers have been published.

(3) A doctor must publish academic papers during his/her doctoral study with Shanghai Jiao Tong University as the first unit (or his/her papers have been accepted). One paper published by a degree applicant as the first author is credited as 1 paper; one paper published as the second author (the first author must be his/her instructor) is credited as 1/2 paper; papers published by the third author and subsequent author are omitted. Papers published by a doctor during his/her master degree study are not included into those papers published during the doctoral study.

(4) The discipline of electrical engineering welcomes and supports the instructors to develop higher standards for their students according to actual conditions.

**八、学位论文** Thesis/dissertation work

1、选题与综述的要求；

博士学位论文应对所研究的课题在基本理论、计算方法、测试技术、工艺制造等某一方面有新的见解，在学术上有重要的理论意义或现实意义。

2、规范性要求；

在学位论文进行中，博士研究生应按计划每年1～2次在研究所组织的学术会议上做学术报告，汇报论文进展情况。学位论文的内容，除理论分析外，还应包括实验验证或计算机软件开发，并有可靠的创造性学术成果，能经得起检验。论文推理严密，材料翔实，数据可靠，表达准确，层次分明，图表规范。学位论文的草稿，应在学习结束前三个月完成，并提交导师审阅通过，然后按《上海交通大学研究生学位论文答辩及学位申请工作细则》的规定组织评审和答辩。

3、成果创新性要求

在科学理论、专门技术或研究方法上有创新，并取得新的进展，达到电气工程学科国内领先或国际先进水平。

1. Topic selection and summarization requirements;

A doctor paper shall present new insights on basic theories, calculation methods, test technology, crafting and others of the topic, and academically have significant theoretical or realistic significance.

2. Normative requirements;

A doctoral student shall present an academic report and report the progress of the paper on 1-2 academic conference(s) organized by the Research Institute every year as scheduled in preparing an academic paper. The academic paper shall include experimental verification or computer software development in addition to theoretical analysis, along with reliable and amenable creative academic results. A paper is characterized by exact reasoning, detailed materials, reliable data, accurate expression, clear structure and standard charts. The doctor shall finish the draft of the academic paper 3 months before the study, submit his/her instructor for review, and then organize the review and defense according to the Detailed Rules for Academic Paper Defense and Degree Application of Postgraduates of Shanghai Jiao Tong University.

3. Innovation requirements

A doctor shall make innovations in scientific theories, expertise or research methods, make new progress and reach domestic or international advanced level of the discipline of electrical engineering.

**九、课程设置** Courses

详见下页 Please refer to the next page.

撰稿人签字： 日 期：

校稿人签字： 日 期：

审核人签字： 日 期：

主管院长签字： 院系公章 日期：

说明：

1. 培养方案制定完成并经院系学位委员会审核通过后，全日制请将本表格电子版(word)发送至jingliang@sjtu.edu.cn;
2. 请在新研究生教育管理信息系统完成新培养方案的申请，并在审核通过后将本表格的纸质版（签字盖章）送交研究生院存档。

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| **课程类别****Category** | **课程代码****Course Code** | **课程名称 Course Name** | **学分****Credit** | **授课语言****Language\*** | **开课学期****Semester** | **可以计算GPA** | **必须计算GPA** | **备注 Note** |
| **中文Chinese** | **English 英文** |
| 公共基础课General Courses | FL6001 | 学术英语 | English for Academic Purposes | 2 | 英文 in English | 秋季 Fall | 是 Yes | 是 Yes | 必修 Compulsory |
| MARX7001 | 中国马克思主义与当代 | Marxism in China | 2 | 中文 in Chinese | 秋季 Fall | 否 No |  | 必修 Compulsory |
| GE6001 | 学术写作、规范与伦理 | Scientific Writing, Integrity and Ethics | 1 | 中文 in Chinese | 春秋季 Spring Fall | 否 No |  | 必修 Compulsory |
| MARX6003 | 自然辩证法概论 | Dialectic of Nature | 1 | 中文 in Chinese | 春秋季 Spring Fall | 是 Yes |  | 必修 Compulsory |
| 专业基础课Program Core Courses | C031702 | 电力系统动态计算与建模 | Power System Dynamics-Computing and Modelling | 3 | 英文 in English | 春季 Spring | 否 No |  |  |
| C031715 | 非线性控制理论及应用 | Nonlinear Control Theory and Applications | 2 | 中文 in Chinese | 秋季 Fall | 否 No |  | 必修 Compulsory 致远荣誉课程 |
| C031718 | 博士生电气技术试验 | Electrical Lab for Doctoral Students | 1 | 中文 in Chinese | 秋季 Fall | 否 No |  |  |
| EE26009 | 电力电子系统建模与控制 | Modelling and Control for Power Electronics System | 2 | 英文 in English | 春季 Spring | 是 Yes |  |  |
| EE26014 | 逆变器理论与工程 | Inverter Theory and Engineering | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| EE28002 | 高等电力电子学 | Advanced Power Electronics | 3 | 中文 in Chinese | 秋季 Fall | 否 No |  |  |
| F031506 | 电力系统规划 | Power System Planning | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031503 | 运动控制系统 | Motion Control System | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031505 | 电力系统安全分析 | Power System Security Analysis | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031506 | 电力系统可靠性 | Reliability of Power Systems | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031507 | 计算机继电保护导论 | Introduction to Computer Relaying Protection | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031508 | 现代控制理论 | Modern Control Theory | 3 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031509 | 电气设备在线检测与状态维修 | Online Monitoring & Status Maintenance of Electric Power Equipment | 3 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031510 | 工程电磁场数值计算 | Numerical Techniques in Electromagnetics | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031511 | 高电压数字测量技术 | High Voltage Digital Measurement Technology | 3 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031515 | 现代电机控制系统 | Modern Motor Control System | 3 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031523 | 电力系统稳态分析 | power system static state analysis | 3 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031524 | 电能质量 | Quality of Power Supply | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031602 | 自适应控制 | Adaptive control | 3 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| X031604 | 电力系统暂态稳定 | Transient Stability of Power Systems | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| MATH6004 | 计算方法 | Numerical Analysis | 3 | 中英文并行开班 in both Chinese & English | 春秋季 Spring Fall | 是 Yes |  | 选课门数：4选2最少选课学分：6Min Courses: 2Min Credits: 6 |
| MATH6012 | 应用泛函分析 | Functional Analysis with Application | 3 | 中英文并行开班 in both Chinese & English | 春秋季 Spring Fall | 是 Yes |  |
| MA26073 | 矩阵理论 | Matrix Theory | 3 | 中英文并行开班 in both Chinese & English | 春秋季 Spring Fall | 是 Yes |  |
| MATH6015 | 最优化方法 | Syllabus for Optimization Methods | 3 | 中英文并行开班 in both Chinese & English | 春秋季 Spring Fall | 是 Yes |  |
| 专业前沿课Program Frontier Courses | C031703 | 电力系统分析专题 | Selected Topics on Power System Analysis | 3 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| C031705 | 高电压前沿技术专题 | Advanced High Voltage Techniques | 3 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| C031717 | 现代电力电子变换技术专题 | Key Issues of Modern Power Electronic Converter Technologies | 2 | 英文 in English | 春季 Spring | 是 Yes |  |  |
| EE26004 | 新能源电力变换与并网技术 | Power convertor of renewable energy and its integration with the grid | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| EE26007 | 现代电力系统运行优化理论与应用 | Theory and Application of Optimization in Modern Power System Operation | 2 | 英文 in English | 秋季 Fall | 是 Yes |  |  |
| F031603 | 可再生能源发电系统 | Renewable Energy System for Electric Power Generation | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031604 | 超导材料与应用技术 | Applied science of Superconductivity | 2 | 英文 in English | 春季 Spring | 是 Yes |  |  |
| GE6012 | 学术报告会或讨论会 | Academic Speech and Seminar | 2 | 中文 in Chinese | 春季 Spring | 是 Yes  |  | 必修 Compulsory |
| X031504 | 电机专题 | Topics on Electric Machine | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| X031601 | 电力系统电磁兼容 | EMC in Electric Power Systems | 3 | 英文 in English | 秋季 Fall | 是 Yes |  |  |
| EE8012 | 电力大数据基础 | Basis of Big Data Analytics for Smart Grid | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| 专业选修课Program Elective Courses | EE26008 | 多物理场耦合与有限元分析 | Multiphysics and FEM analysis | 2 | 英文 in English | 秋季 Fall | 是 Yes |  |  |
| F031507 | 电力电子技术在电力系统中的应用 | Power Electronics and Application in Power System | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| F031508 | 超高压输电线继电保护 | Relaying Protection for Extra-high Voltage Transmission Line | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| F031510 | 电力系统面向对象建模技术 | Object-Oriented Modeling Technology for Power Systems | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031512 | 数学在电力系统中的应用 | Application of Mathematics in Power System | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031513 | 灵活交流输电技术实验 | The Experimentations of FACTS | 2 | 英文 in English | 秋季 Fall | 是 Yes |  |  |
| F031514 | 电力市场导论 | Introduction to Power Market | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031524 | 电力装置及器件的电子保护技术 | Electronic Protective Principle of Electrical Equipments and Devices | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| F031525 | 现代电源技术 | Modern Power Source Technique | 2 | 英文 in English | 春季 Spring | 是 Yes |  |  |
| F031526 | 人工神经网络原理与应用 | Neural Network Principles and Application | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031534 | 电力传动调速控制综合实验 | Comprehensive Experiment of Electric Drive Speed Regulation and Control | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| F031537 | 现代电机设计 | Design of Modern Electric Machines | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031540 | 电力系统数字仿真软件应用 | Power systems digital simulation - software application | 3 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031544 | 电站综合自动化系统 | Distribution automation system | 2 | 中文 in Chinese | 春季 Spring | 是 Yes |  |  |
| F031546 | 电子系统综合设计 | Electrons System Design | 2 | 中文 in Chinese | 秋季 Fall | 是 Yes |  |  |
| 任意选修课Elective Courses |  |  |  |  |  |  |  |  |  |