

# (085800-1)能源动力—动力学科 2021 级全日制工程博士—硕博连读生源研 究生培养方案

2021 Full-time Professional Doctoral Program (Combined Master and Doctoral) for Energy and  
Power Engineering-Power Engineering

## 一、基本信息 Basic Information

|                       |   |                             |                  |                      |    |
|-----------------------|---|-----------------------------|------------------|----------------------|----|
| 院系名称<br>School        | 机械与动力工程学院<br>School of Mechanical Engineering                 |                             | 适用年级<br>Grade    | 2021 级<br>2021 Class |    |
| 适用专业<br>Major         | 动力工程及工程热物理<br>Power Engineering and Engineering Thermophysics |                             | 标准学制<br>Duration | 4 年<br>4 Years       |    |
| 学习形式<br>Study Mode    | 全日制 Full time   |                             |                  |                      |    |
| 项目类型<br>Program Type  | 专业型 Professional  |                             |                  |                      |    |
| 培养层次<br>Program Level | 硕博连读生 Combined Master and Doctoral                            |                             |                  |                      |    |
| 最低学分<br>Min Credit    | 12  | 最低 GPA 学分<br>Min GPA Credit | NA               | 最低 GPA<br>Min GPA    | NA |

## 二、学科简介 Introduction

上海交通大学动力工程及工程热物理学科始建于 1913 年，1953 年招收我国解放后第一批研究生，是国家首批一级重点学科，首批一级学科博士点。2011 年所依托的机械与动力工程学院入选国家高等教育改革试点学院。在百年发展的历史上，培养了“两弹一星”科学家钱学森、王希季等一大批杰出人才。2016 年 5 月入选全球 ESI 工程学万分之一学科。本学科设有“动力工程与工程热物理”一级学科博士点并设有“动力工程及工程热物理”博士后流动站。

学科拥有汽车电子控制技术国家工程实验室、燃煤污染物减排国家工程实验室（上海）、船舶与海洋工程动力系统国家工程实验室（上海交大）等 3 个国家级基地，动力机械与工程教育部重点实验室、太阳能发电及制冷教育部工程研究中心、燃气轮机与民用航空发动机教育部工程研究中心等省部级基地，下设叶轮机械、新能源动力、热能工程、制冷与低温、工程热物理和燃料电池等研究所。本学科师资力量雄厚，有工程院院士 3 人，中科院院士 1 人，国家创先争优奖 1 人，国家级教学名师 1 人，国家特聘专家 3 人，长江特聘（讲座）教授 3 人，国家杰青基金获得者 7 人，优青 4 人，青年长江 1 人，“百千万人才工程”国家级人选 4 人。拥有国家自然科学基金创新群体、教育部创新团队和科技部创新人才推进计划重点领域创新团队等先进群体。本学科科研成果丰硕，近年来主持承担国家自然科学基金重大项目、重点项目、国家重点研发专项等 20 余项，2005 年以来获国家自然科学基金 3 项，国家技术发明奖 2 项，国家科技进步二等奖 2 项。

动力工程与工程热物理博士点为我国能源与动力领域累计培养博士数千名，包括工程院院士黄震教授等，大批博士毕业生成为科学家、技术权威和行业领袖，为我国能源动力学科和行业发展做出了积极贡献。“全日制工程博士-硕博连读生源”研究生培养过程注重专业理论与工程实践的结合，以解决重大工程和技术问题为导向，注重培养解决工程和技术问题的能力，希

望毕业生将来成为工程技术领域的带头人，工程大师和技术精英。

The discipline of Power Engineering and Engineering Thermophysics(PEET) in Shanghai Jiao Tong University was established in 1913. In 1953, it was selected as the first batch of state key discipline as well as one of the first disciplines in China that offered Doctoral degree program in Power and Energy Engineering. Affiliated to the School of Mechanical Engineering, it was selected as one of the national pilot schools by Ministry of Education(MOE) in 2011. Over the past century, the discipline has nurtured tens of thousands of graduates, contributing significantly to scientific and technological developments as well as economic growth at the national and international levels. Notable alumni include Xuesen Qian (co-founder of Jet Propulsion Laboratory) and Xiji Wang, whom were awarded the highest national honor – the Two Bombs and One Satellite Meritorious Award. Engineering discipline including PEET was rated as one of the top 0.01% ESI disciplines in May 2016. Aiming to develop an internationally renowned and cutting-edge research in PEET, there has been rapid progress, engagement with world-class scientists, grooming of national talents, and scientific research in the recent decades.

Cutting-edge research activities currently conducted in PEET are rooted in several national and key regional laboratories, which include National Engineering Laboratory for Automotive Electronic Control Technology, National Engineering Laboratory for Reducing Emissions from Coal Combustion (Shanghai), National Engineering Laboratory for Marine and Ocean Engineering Power System (SJTU), Key Laboratory for Power Machinery and Engineering of MOE, Engineering Research Center of Chinese Ministry of Education (MOE) for Solar Power and Refrigeration, Gas Turbine and Civil Aero-engine. The full spectrum of research directions include Turbomachinery, Advanced Energy and Powertrain Technology, Thermal Energy, Refrigeration and Cryogenics, Engineering Thermophysics and Full Cell. The faculty includes one member of Chinese Academy of Sciences, three members of Chinese Academy of Engineering, one National Excellence Awardee, one National Renowned Teacher, three National Distinguished Professors, and three Chair Professors of Changjiang Scholars Program. In addition, seven faculty members were awarded The National Science Fund for Distinguished Young Scholars, four faculty members were awarded The National Science Fund for Excellent Young Scholars, one faculty member were awarded the Young Changjiang Scholars Program. Our pursuit of research innovation and global excellence has been recognized worldwide. The research were mainly granted by National High Technology Research Development Program China, National Natural Science Foundation of China, and National Basic Research Program of China. Research outcomes have led to 3 National Natural Science Awards, 2 National Technology Invention Awards and 2 Second-grade State Science and Technology Progress Award.

As a key institute of doctoral degree education in China, PEET is dedicated to nurturing academically inclined, all-rounded, and innovation-orientated students with global perspectives, who can become top engineers or renowned scholars in the global community. There have been thousands of Ph.D. degree students thus far, most of the alumni have grown to scientists, technology experts and industry leaders, such as Professor Zhen Huang, the member of Chinese Academy of Engineering and Professor Ruzhu Wang, an international renowned refrigeration expert. Focusing on the combination of professional theory and engineering practice and solving major engineering and technical problems, It is expected that graduates will finally become engineering and technology leader in the future, engineering master and technical elite.

### 三、培养目标 Program Objective

1、具有能源与动力工程领域坚实宽广的基础理论和系统深入的专门知识；

Having a good grasp of the basic theories as well as a systematic and in-depth knowledge of power engineering and engineering thermophysics.

2、掌握能源与动力工程领域的先进工艺和技术；

Mastering advance technology and skills of energy and power engineering.

3、深入了解能源动力工程领域的最新技术进展和相关学术前沿；

Deeply understanding the progress, tendency and frontier of his/her own research field.

4、具有独立从事技术开发和工程应用的能力，能熟练运用本工程领域的基础理论和专业知识，并在工程领域取得前沿技术和工程应用方面的创造性成果，力争成为工程技术领军人才；

Capable of independent technology development and engineering application. Good at utilizing the fundamental theories, professional knowledge and frontier technology. Obtainment of innovative achievement either in theory or real-world application.

5、具有良好的国际视野、能够熟练地阅读和翻译外文文献，掌握一定的外语交流能力；

Having good global vision, including fluent reading and translating of professional documents, and academic communication skills.

6、能胜任大型企业、科研院所技术研发、工程应用或科技管理等工作。

Qualified for engineering technology R&D, or scientific and technical management in large enterprise or research institutions.

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

硕博连读生源的全日制工程博士生源采用全日制学习、导师负责制培养模式。

自成功转入博士阶段后，学制为四年。博士阶段未能按时完成学业者，经申请批准后其学习年限可适当延长，博士阶段的学习年限最长可以延期至六年。

Full-time Professional Doctoral Program (Combined Master and Doctoral) students are tutored full-time by supervisors.

The length of Full-time Professional Doctoral Program (Combined Master and Doctoral) is 4 years after entering the doctoral level. Students who fail to complete the program within 4 years could apply for extension, with a maximum length of 6 years upon approval.

#### 五、课程学习要求 Course Requirement

全日制工程博士生-硕博连读生源，课程总学分 $\geq 12$  学分，总学分上限为 18 学分。

**Full-time Professional Doctoral Program (Combined Master and Doctoral). Minimum credits: 12 credits.**

1. 公共基础课：

General Courses.

MARX7001 中国马克思主义与当代，2 学分，必修

MARX7001 Marxism in China, 2 credits, compulsory.

2. 专业选修课：公共前沿选修课，至少 1 学分

Elective Courses: Public frontier elective course, Minimum credits 1 credits.

3. 专业基础课、专业选修课： $\geq 9$  学分

Core Courses and Elective Courses. Minimum credits: 9 credits.

4. 统计如下：

Summarized as below.

| 课程类别<br>Course Type      | 学分要求<br>Required Credits | 门数要求<br>Required Courses | GPA 学分要求<br>Min GPA | 备注<br>Note |
|--------------------------|--------------------------|--------------------------|---------------------|------------|
| 公共基础课<br>General Courses | 2                        | 1                        | NA                  |            |

|   |    |    |    |  |
|---|----|----|----|--|
| 专业基础课 Core Courses、专业选修课 Elective Courses | ≥9 | NA | NA | 跨学科选课不超过 2 门，且仅作为非 GPA 统计源课程。  |
| 专业选修课 Elective Courses                    | 1  | NA | NA | No more than 2 interdisciplinary courses can be selected, which are counted as non-GPA course. |

## 六、培养过程要求 Requirements for Training Process

### (一) 培养过程环节要求：

#### Requirements for Training Process:

**开题报告：**在进入博士阶段的第 4 学期结束前完成。开题报告要求就学位论文选题的科学根据、目的意义、研究内容、预期目标、研究方法和课题条件等做出论证。开题报告的文献阅读量应不少于 50~100 篇。

Dissertation proposal: Dissertation proposal should be finished before the end of 4<sup>th</sup> semester of doctoral program, which requires an argument on the scientific basis, purpose and significance, research content, expected goals, research methods, and project conditions of intended dissertation topic. Students should read no less than 50 to 100 journal papers of related topic during preparation.

硕博连读生源全日制工程博士生的论文开题由学院按学科统一组织。首次开题不通过者，可申请二次开题；两次开题均不通过者，经学院审议后进入分流淘汰程序。

Thesis proposal work is organized by discipline. Anyone who fail thesis proposal evaluation twice will enter the shunt elimination after school's deliberation.

**年度考核：**开题报告通过后，每自然年进行一次。申请预答辩之前须至少参加一次学院统一组织的年度考核并且考核结果为通过。最晚在第 6 学期结束前完成首次年度考核。开题报告通过不满半年者可不参加当年年度考核。未按期在第 6 学期结束前完成首次年度考核者，第 7 学期起不予以注册，且导师记录博士生培养负面清单 1 次。参加学院统一组织的年度考核次数不做限制。具体办法参照《机械与动力工程学院博士生年度考核管理办法》执行。

Annual progress report: After completion of the dissertation proposal, annual progress reports evaluation will be held every year. Before applying for the dissertation pre-defense, the student must attend at least once organized by the school and pass. The first annual progress report must be completed by the end of 6<sup>th</sup> semester at the latest. Those who pass the dissertation proposal for less than half a year may not participate in the annual progress report. Those who fail to complete the first annual progress report before the end of the 6<sup>th</sup> semester will not be registered from the 7<sup>th</sup> semester, and the supervisor will record the negative list for the cultivation of Ph.D. students once. There is no limit to the number of annual progress report organized by the school. Please refer to Administrative Measures for Annual Progress Report of Ph.D Students of School of Mechanical Engineering for specific measures.

**论文预答辩：**参加学院统一组织的年度考核且结果为“优秀”或“良好”者，可申请预答辩。申请者最早可于年度考核通过后的下一学期、正式答辩前的三个月提出预答辩申请。预答辩不通过者不能进入后续博士学位申请流程。

Dissertation pre-defense: Those who have participated in the annual progress report organized by the school and the result is "excellent" or "good" can apply for the pre-defense. The applicant may, at the earliest, submit an application for pre-defense in the next semester after passing the annual progress report and three months before the formal defense. Those who do not pass the pre-defense cannot enter the subsequent doctoral degree application process.

**论文答辩：**在第八学期前完成（鼓励条件成熟情况下尽早完成，但不早于第六学期），未完成者最多可延期至十二学期。答辩由学科组织，答辩前将由学院督导进行形式审查，对发表小论文不合格、盲审成绩过低等情况将不予审核通过。

Dissertation Defense: Students are required to pass the dissertation defense before the end of the 8<sup>th</sup> semester

(Students are encouraged to complete as early as possible, but no earlier than the 6<sup>th</sup> semester.). Students could apply for extension and should complete the dissertation defense before the end of the 12<sup>th</sup> semester. The dissertation defense is organized by discipline. Before the defense, a routine review will be conducted by the school. Anyone who does not meet the graduation requirements or fails the blind review shall not be approved for dissertation defense.

### **(二) 工程实践环节要求:**

Requirements for engineering practice process:

1、通过在岗参与重大项目，完成工程实践要求。

2、结合重大项目中关键或难点技术环节，了解其发展历史、国内外现状，参加本领域前沿的业务研讨及交流活动，并在活动中做专门报告。

1. Complete the engineering practice requirements by participating in major projects.

2. Participate in cutting-edge business seminars and exchange activities in this field, and make professional keynote speech.

### **(三) 学术写作与交流要求:**

#### **Requirements for Academic Writing and Communication**

1、至少精通一门外国语，能熟练地阅读本专业外文资料，具有较强的写作能力，须有以排序第一作者在国际重要学术期刊或高水平国内期刊上发表与博士学位论文研究工作密切相关的研究性学术论文的经历。国际重要学术期刊和高水平国内期刊的具体认定办法详见七“学术成果要求”。

Students should be proficient in at least one foreign language and be able to read foreign language materials in their major fluently. With strong writing ability, the student should have the experience of publishing research academic papers that are closely related to the research work of their doctoral dissertation in important international academic journals or high-level domestic journals as the first author. For specific identification methods of important international academic journals and high-level domestic journals, please refer to seventh "Requirements for Academic Achievements".

2、应具备国内外学术交流的能力，在读期间必须在高水平国内外学术会议上以口头报告形式开展学术交流至少1次。学术交流的内容须与博士学位论文研究工作密切相关。交流内容等具体要求详见《上海交通大学关于博士研究生参加学术交流的规定》。高水平国内外学术会议的具体认定办法详见七“学术成果要求”。

Students should have the ability of domestic and foreign academic communication. During the study period, students must have at least one academic communication in the form of oral presentation in high-level domestic and foreign academic conferences, and the content of academic communication must be closely related to the research work of doctoral dissertation. Please refer to the *Regulations of Shanghai Jiao Tong University on the Participation of Ph.D Students in Academic Exchange* for the detailed requirements on the form of exchange. The specific identification methods of high-level domestic and foreign academic conferences are detailed in the seventh "Requirements for Academic Achievements".

## **七、学术成果要求 Requirements for Academic Achievements**

博士学位论文的创新成果是评价学位论文水平的重要参考，必须是以学位申请人为主在攻读博士学位期间取得，且与学位论文内容密切相关。

The innovative achievements of the doctoral dissertation are an important reference to evaluate the level of the dissertation, which must be obtained by the degree applicants during their doctoral study and closely related to the content of the dissertation.

用于申请博士学位的学位论文中必须包含不少于三项以申请人为主要完成人并以上海交通大学为第一完成单位的创新性成果。创新性成果的主要完成人一般应为成果第一完成人，如果第一完成人是申请人的博士生导师且申请人排序第二，则申请人也认定为主要完成人。创新性成果原则上应以上海交通大学为第一完成单位。

The dissertation used for the Ph.D degree application must include at least three innovative works with the applicant as the principal composer and Shanghai Jiao Tong University as the first institution. The principal composer of the innovative achievement shall generally be the first author of the achievement. If the first composer is the Ph.D supervisor of the applicant and the applicant ranks second, the applicant shall also be identified as the principal

composer. Shanghai Jiao Tong University should be the first institution to complete the innovative achievements in principle.

博士学位论文的创新性成果应该具有重要的理论或工程应用价值，具体展现形式包括：

The innovative achievements of the Ph.D dissertation should have important theoretical or engineering application value, and the specific manifestation forms include:

(1) 发表在国际重要学术期刊或高水平国内学术期刊上的研究性学术论文。其中，国际重要学术期刊是指 SCI 刊源期刊，但不包含按《机械与动力工程学院不推荐 SCI 期刊认定办法》认定的不推荐期刊；高水平国内期刊是指《高质量科技期刊分级目录》相关领域 T1/T2 档核心期刊。国际重要学术期刊与高水平国内期刊认定以论文发表或录用当年为准认定。

Research academic papers published in important international academic journals or high-level domestic academic journals. The important international academic journals refer to the SCI Journals, but do not include the non-recommended journals identified according to the *Measures for the Recognition of Non-recommended SCI Journals by the School of Mechanical Engineering*. High-level domestic academic journals refer to the related fields of T1/T2 core periodicals in the *Classification Catalogue of High-quality Sci-Tech Journals*. The accreditation of important international academic journals and high-level domestic journals shall be subject to the year when the paper was published or accepted.

(2) 发表在高水平学术会议的会议论文或者口头报告且能提供相应证明材料。高水平学术会议包括本学科公认的国际性学术组织主办的系列专业性学术会议或《上海交通大学资助研究生参加国际会议项目-重要国际会议目录》中的会议。口头报告需提供会议录用摘要证明。如果学术会议论文或口头报告学术贡献与发表期刊论文相同，则认定为一项成果。

Conference papers or oral presentations presented at high-level academic conferences with supporting materials. High-level academic conferences include a series of professional academic conferences hosted by recognized international academic organizations within the discipline or conferences listed in the *International Conference Program Sponsored by Shanghai Jiao Tong University - List of Important International Conferences*. Oral presentation should provide proof of acceptance summary. If the academic conference paper or oral presentation has the same academic contribution as the published journal paper, they will be considered as the same achievement.

(3) 获得授权的重要发明专利且能提供相关实施应用证明材料。

The important invention patent that has been authorized and can provide relevant application proof materials.

(4) 由中国国家标准管理委员会正式发布国家标准，或由 ISO、IEEE、ASME 等国际组织发布的国际标准，及相关行业归口部门统一管理发布的行业标准。

National standards officially issued by the Standardization Administration Committee of China, or international standards issued by ISO, IEEE, ASME and other international organizations, as well as industrial standards uniformly managed and issued by relevant industry departments.

(5) 由学院学位评定委员会委员和同行专家组成的专家组，或有关权威组织机构认定的其他重大成果。

Other major achievements recognized by the expert group composed of members of the Academic Degree Assessment Committee and peer experts or by relevant authoritative organizations.

具体详见《上海交大机械与动力工程学院博士专业学位授予标准》，对达不到创新性成果要求的博士生，将无法进入正式答辩。

See details in *Awarding Criteria for Professional Doctor Degree from School of Mechanical Engineering, Shanghai Jiao Tong University*. Anyone who cannot meet the innovative requirements is not allowed to apply for the dissertation defense.

## 八、学位论文 Dissertation work

学位论文是进行学位评定的主要依据，应能反映出作者在本学科上已掌握坚实宽广的基础理论、系统深入的专门知识和规范科学的研究方法。

Dissertation is the main basis for degree evaluation, which should reflect the author's grasp of solid and broad basic theory, systematic and in-depth expertise and standardized scientific research methods in the subject.

### 1、选题与综述

## Topic Selection and Review

博士学位论文的选题应围绕行业重大、重点工程项目或科技攻关项目开展，选题应具有重要的创新性、先进性、可行性和应用性。

The topic selection of the doctoral dissertation should focus on the major and key engineering projects of the industry or the key projects of science and technology. The topic should be innovative, advanced, feasible and applicable.

文献综述应在全面搜集、阅读大量有关研究文献的基础上，经过归纳整理、分析鉴别，对所研究的问题在一定时期内已经取得的研究成果、存在问题以及新的发展趋势等进行系统、全面、客观的叙述和评论，为论文课题的确立提供支持和论证。

Literature review is based on the comprehensive collection and reading of a large number of relevant research literature. After summarizing, analyzing and discriminating, the literature review systematically, comprehensively and objectively narrates and comments the research achievements, existing problems and new development trends of the issues studied in a certain period of time, providing support and demonstration for the establishment of the topic of the dissertation.

## 2、规范性要求

### Normative requirements

博士学位论文必须是一篇系统、完整的学术论文，是学位申请者在攻读博士学位期间在导师指导下独立完成的科研成果，应严格遵守《上海交通大学研究生学术规范》和《机械与动力工程学院研究生学术道德规范》进行学位论文工作。

Ph.D dissertation must be a systematic and complete academic paper. Dissertation is the achievement of research completed independently by the applicant under the supervision of supervisor during doctoral study. Students should strictly abide by the *Academic Code for Graduate Students of Shanghai Jiao Tong University* and the *Academic Code of Ethics for Graduate Students of School of Mechanical Engineering* in their dissertation work.

博士学位论文的学术观点必须明确，立论正确，推理严谨，数据真实，图表规范，层次分明，语言准确，文字通畅。

The academic point of view of a Ph.D dissertation must be clear, correct in argument, rigorous in reasoning, true in data, standardized in chart, clear in hierarchy, accurate in language and smooth in text.

学位论文撰写必须遵循和符合《机械与动力工程学院学位论文撰写指南》的具体要求。

Dissertation writing must follow and conform to the specific requirements of *Dissertation Writing Guide of School of Mechanical 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 SherryLi327@sjtu.edu.cn,

非全日制请将本表格电子版(word)发送至 jshen@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。



| 课程类别                          | 课程代码        | 课程名称 Course Name |   | 学分     | 授课语言          | 开课学期            | 可以计算 GPA | 必须计算 GPA | 备注 Note       |
|-------------------------------|-------------|------------------|---|--------|---------------|-----------------|----------|----------|---------------|
| Category                      | Course Code | 中文 Chinese       | English 英文                                | Credit | Language*     | Semester        |          |          |               |
| 公共基础课<br>General Courses      | MARX7001    | 中国马克思主义与当代       | Marxism in China                          | 2      | 中文 in Chinese | 春季 Spring       | 否 No     | 否 No     | 必修 Compulsory |
|                               |             |                  |   |        |               |                 |          |          |               |
|                               |             |                  |   |        |               |                 |          |          |               |
| 专业基础课<br>Program Core Courses | ME6100H     | 高等机构学            | Advanced Mechanism and Machine Science    | 3      | 中文 in Chinese | 秋季 Fall         | 是 Yes    | 否 No     |               |
|                               | ME6120      | 高等机械动力学          | Mechanical System Dynamics                | 3      | 中文 in Chinese | 春秋季 Spring/Fall | 是 Yes    | 否 No     | 二选一           |
|                               | ME6120H     | 高等机械动力学          | Mechanical System Dynamics                | 3      | 中文 in Chinese | 春季 Spring       | 是 Yes    | 否 No     |               |
|                               | ME6520      | 数字信号处理           | Digital Signal Processing                 | 3      | 中文 in Chinese | 秋季 Fall         | 是 Yes    | 否 No     | 二选一           |
|                               | ME6521H     | 数字信号处理与应用        | Digital Signal Processing and Application | 3      | 英文 in English | 秋季 Fall         | 是 Yes    | 否 No     |               |
|                               | ME6540      | 现代控制理论           | Modern Control Theory                     | 3      | 中文 in Chinese | 春秋季 Spring/Fall | 是 Yes    | 否 No     | 二选一           |
|                               | ME6540H     | 现代控制理论           | Modern Control Theory                     | 3      | 中文 in Chinese | 秋季 Fall         | 是 Yes    | 否 No     |               |
|                               | PE6100      | 高等燃烧学            | Advanced Combustion Theory                | 3      | 中文 in Chinese | 秋季 Fall         | 是 Yes    | 否 No     | 二选一           |
|                               | PE6101H     | 高等燃烧理论           | Advanced Combustion Theory                | 3      | 英文 in English | 春季 Spring       | 是 Yes    | 否 No     |               |
|                               | PE6200      | 高等传热传质学          | Advanced Heat and Mass Transfer           | 3      | 中文 in Chinese | 春季 Spring       | 是 Yes    | 否 No     | 三选一           |
|                               | PE6201      | 高等传热学            | Advanced Heat Transfer                    | 3      | 英文 in English | 秋季 Fall         | 是 Yes    | 否 No     |               |
|                               | PE6201H     | 高等传热学            | Advanced Heat Transfer                    | 3      | 英文 in English | 秋季 Fall         | 是 Yes    | 否 No     |               |
|                               | PE6220      | 高等工程热力学          | Advance Engineering Thermodynamics        | 3      | 中文 in Chinese | 春秋季 Spring/Fall | 是 Yes    | 否 No     | 三选一           |

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|---------|-------------|---|---|---------------|-----------------|-------|------|-----|
| PE6221  | 高等热力学       | Advanced Thermodynamics   | 3 | 英文 in English | 秋季 Fall         | 是 Yes | 否 No |     |
| PE6221H | 高等热力学       | Advanced Thermodynamics   | 3 | 英文 in English | 春季 Spring       | 是 Yes | 否 No |     |
| ME6104  | 摩擦学与润滑理论    | Tribology & Lubrication Theory                                    | 3 | 中文 in Chinese | 春季 Spring       | 是 Yes | 否 No | 二选一 |
| ME6105  | 工程摩擦学导论     | Introduction to Engineering Tribology                             | 3 | 英文 in English | 春季 Spring       | 是 Yes | 否 No |     |
| ME6122  | 应用固体力学      | Applied Mechanics of Solids                                       | 3 | 中文 in Chinese | 秋季 Fall         | 是 Yes | 否 No | 二选一 |
| ME6123  | 固体力学        | Mechanics of Solids   | 3 | 英文 in English | 春季 Spring       | 是 Yes | 否 No |     |
| ME6124  | 弹塑性力学       | Elastic & Plastic Mechanics                                       | 3 | 中文 in Chinese | 春秋季 Spring/Fall | 是 Yes | 否 No | 二选一 |
| ME6125  | 金属塑性加工力学    | Plastic Mechanics in Metal Processing                             | 3 | 英文 in English | 秋季 Fall         | 是 Yes | 否 No |     |
| ME6180  | 计算机图形学      | Computer Graphics   | 3 | 中文 in Chinese | 秋季 Fall         | 是 Yes | 否 No |     |
| ME6320  | 机器视觉与应用     | Machine Vision and Its Applications                               | 3 | 中文 in Chinese | 春季 Spring       | 否 No  | 否 No | 二选一 |
| ME6321  | 计算视觉及其智能化应用 | Computational Imaging and Intelligent Application                 | 3 | 英文 in English | 春季 Spring       | 否 No  | 否 No |     |
| ME6522  | 测试原理、传感器与系统 | Basic Principle of Sensors and Systems for Mechanical Measurement | 3 | 中文 in Chinese | 春秋季 Spring/Fall | 是 Yes | 否 No | 二选一 |
| ME6523  | 先进测试技术与仪器   | Advanced Measurement and Instrumentation                          | 3 | 英文 in English | 春季 Spring       | 是 Yes | 否 No |     |

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|--------|--------------|---|---|---------------|-----------|-------|------|-----|
| PE6120 | 高等工程流体力学     | Advanced Fluid Dynamics in Engineering      | 3 | 中文 in Chinese | 秋季 Fall   | 是 Yes | 否 No | 二选一 |
| PE6121 | 高等流体力学       | Advanced Fluid Mechanics                    | 3 | 英文 in English | 秋季 Fall   | 是 Yes | 否 No |     |
| PE6122 | 计算流体力学       | Computational Fluid Dynamics                | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No | 二选一 |
| PE6123 | 计算流体力学与应用    | Computational Fluid Dynamics & Applications | 3 | 英文 in English | 秋季 Fall   | 是 Yes | 否 No |     |
| ME6102 | 机械设计可靠性分析    | Reliability Analysis of Mechanical Design   | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |     |
| ME6140 | 高等振动理论       | Theory of Advanced Vibrations               | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |     |
| ME6142 | 声学原理及计算方法    | Theories and Computation of Acoustics       | 3 | 中文 in Chinese | 秋季 Fall   | 是 Yes | 否 No |     |
| ME6145 | 结构声学         | Structural Acoustics                        | 3 | 英文 in English | 春季 Spring | 否 No  | 否 No |     |
| ME6146 | 转子动力学        | Rotor Dynamics                              | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |     |
| ME6160 | 机器人性能仿真与控制原理 | Performance Simulation and Control of Robot | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |     |
| ME6182 | 现代机械设计学      | Modern Mechanical Design                    | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |     |

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|--------|-------------|---|---|---------------|-----------|-------|------|--|
| ME6220 | 软件工程 II     | Software Engineering II for Manufacturing           | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |  |
| ME6340 | 机械电子学       | Mechatronics  | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| ME6500 | 塑性变形理论与数值模拟 | Plastic Deformation Theory and Numerical Simulation | 3 | 中文 in Chinese | 秋季 Fall   | 是 Yes | 否 No |  |
| ME6524 | 误差分析与测试数据处理 | Error Analysis and Data Processing in Measurement   | 3 | 中文 in Chinese | 秋季 Fall   | 是 Yes | 否 No |  |
| ME6542 | 智能控制技术      | Intelligent Control Technology                      | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |  |
| PE6103 | 燃烧化学动力学     | Combustion Chemical Kinetics                        | 3 | 英文 in English | 春季 Spring | 是 Yes | 否 No |  |
| PE7124 | 多相流理论与计算    | Multiphase Flow Theory and Simulation               | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |  |
| PE7126 | 湍流与传输理论     | Turbulent Flow and Transportation Theory            | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |  |
| PE6202 | 热辐射传热       | Thermal Radiation Heat Transfer                     | 3 | 中文 in Chinese | 春季 Spring | 是 Yes | 否 No |  |

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|--------|------------|---|---|---------------|-----------|-------|------|--|
| PE6205 | 微尺度流动与传热   | Microfluidic Flow and Heat Transfer                           | 3 | 英文 in English | 春季 Spring | 是 Yes | 否 No |  |
| ME7184 | 多学科综合设计    | Multidisciplinary Design                                      | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| ME6222 | 软件技术基础     | Foundation of Software Technology                             | 3 | 中文 in Chinese | 秋季 Fall   | 否 No  | 否 No |  |
| PE6208 | 强化传热理论与技术  | Theory and Technology on Enhanced Heat Transfer               | 3 | 中文 in Chinese | 秋季 Fall   | 否 No  | 否 No |  |
| ME6426 | 智能网联汽车技术   | Intelligent and Connected Vehicle Technology                  | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6400 | 热泵系统及应用    | Heat Pump Systems and Applications                            | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6502 | 内燃机燃烧与排放控制 | Combustion and Emission Control in Internal Combustion Engine | 3 | 中文 in Chinese | 秋季 Fall   | 否 No  | 否 No |  |
| ME6420 | 汽车多能源管理与优化 | Vehicle Multi-energy Management and Optimization              | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| ME6560 | 研究实验技能     | Experimental Skill for Research                               | 3 | 中文 in Chinese | 秋季 Fall   | 否 No  | 否 No |  |

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|---|--------|---------------|--|---|---------------|-----------|------|------|--|
|   | PE7426 | 高等传输理论与化学反应工程 | Advanced Transmission Theory and Chemical Reaction Engineering | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|   |        |               |  |   |               |           |      |      |  |
|   |        |               |  |   |               |           |      |      |  |
|   |        |               |  |   |               |           |      |      |  |
| 专业前沿课<br>Program<br>Frontier<br>Courses |        |               |  |   |               |           |      |      |  |
|   |        |               |  |   |               |           |      |      |  |
|   |        |               |  |   |               |           |      |      |  |
| 专业选修课<br>Program<br>Elective<br>Courses | ME6106 | 计算几何学         | Computational Geometry   | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|   | ME6126 | 高等结构动力学       | Advanced Structural Dynamics                                   | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
|   | ME6149 | 气动声学          | Aeroacoustics  | 3 | 英文 in English | 秋季 Fall   | 否 No | 否 No |  |
|   | ME6151 | 先进噪声控制技术      | Advanced Noise Control Techniques                              | 3 | 英文 in English | 秋季 Fall   | 否 No | 否 No |  |
|   | ME7162 | 步行机器人机构学      | Walking Robotic Mechanisms                                     | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|   | ME6200 | 弹塑性加工理论       | Solid Mechanics in Machining                                   | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |

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| ME6202 | 微细制造         | Micro Manufacturing  | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| ME6204 | 薄板成形理论及技术    | Sheet Metal Forming Theory and Technology                      | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| ME6207 | 超精密智能制造技术    | Ultra-precision Smart Manufacturing                            | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME6209 | 先进复合材料及其加工技术 | Advanced Composites and Their Manufacturing Techniques         | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME6343 | 工业智能维护与预知诊断  | Intelligent Maintenance and Prognostics for Industrial Systems | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME6423 | 现代汽车动力总成技术   | Advanced Powertrain Technologies                               | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME6424 | 汽车电子控制软件工程   | Software Engineering for Automotive Electronic Control System  | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |

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|--------|--------------|--|---|---------------|-----------|------|------|--|
| ME7429 | 汽车控制工程       | Modern Vehicle Control Engineering                               | 3 | 英文 in English | 秋季 Fall   | 否 No | 否 No |  |
| ME6503 | 先进工程应用中的高温材料 | High Temperature Materials for Advanced Engineering Applications | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME6527 | 先进激光诊断原理与技术  | Advanced Laser Diagnostic Technology                             | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| ME7528 | 高等测试技术       | Advanced Techniques in Measurement                               | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| PE6105 | 先进排放控制技术     | Advanced Emission Control Technologies                           | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| PE7106 | 计算燃烧学        | Computational Combustion   | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| PE6140 | 叶轮机械气动力学     | Turbomachinery Aerodynamics                                      | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
| PE6143 | 叶轮机械试验方法与设计  | Turbomachinery Experimental Design                               | 3 | 英文 in English | 春季 Spring | 否 No | 否 No |  |
| PE6207 | 计算材料热物理      | Computational Materials Thermophysics                            | 3 | 英文 in English | 秋季 Fall   | 否 No | 否 No |  |



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|--------|----------------|--|---|---------------|-----------|------|------|--|
| PE6300 | 湍流两相流动的模化与数值仿真 | Modeling and Numerical Simulation of Turbulent Two-phase Flow          | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| PE6302 | 煤粉燃烧与气化理论      | Theory of Coal Combustion and Gasification                             | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
| PE6304 | 微细颗粒动力学        | Fine Particle Dynamics   | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
| PE6307 | 循环流化床燃烧技术      | Circulating Fluidized Bed Combustion                                   | 3 | 英文 in English | 秋季 Fall   | 否 No | 否 No |  |
| PE6402 | 现代人工环境技术       | Modern Artificial Environment Technology                               | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
| PE6404 | 制冷低温系统的设计与实践   | Design and Practice of Refrigeration and Cryogenic Systems             | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
| PE6406 | 制冷空调系统的仿真优化与控制 | Simulation, Optimization and Control of Refrigeration and HVAC Systems | 3 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |  |
| PE6420 | 能源清洁与梯级利用      | Energy Clean and Cascade Utilization                                   | 3 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |

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|--------|------------------|---|---|---------------|-----------|-------|------|--|
| PE6422 | 热力系统建模与仿真        | Analysis of Energy Utilization Systems                                | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6424 | 先进动力循环分析         | Analysis of Advanced Thermal Power Cycles                             | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6441 | 新能源系统            | New Energy Systems  | 3 | 英文 in English | 秋季 Fall   | 是 Yes | 否 No |  |
| PE6442 | 建筑节能与太阳能利用       | Building Energy Saving and Solar Energy Utilization                   | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6500 | 内燃机电控技术          | Electronic Control Technology in Internal Combustion Engine           | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6504 | 内燃机性能仿真与优化       | Simulation and Optimization of Internal Combustion Engine Performance | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |
| PE6523 | 先进空气动力学测量技术基础与实践 | Analysis of Advanced Thermal Power Cycles                             | 3 | 英文 in English | 秋季 Fall   | 否 No  | 否 No |  |
| PE7540 | 先进能源材料导论         | Introduction on Advanced Energy Materials                             | 3 | 中文 in Chinese | 春季 Spring | 否 No  | 否 No |  |

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|----------|---------------------------|--|-----|---------------|-----------|------|------|---------------|
| PE6542   | 能源电化学基础                   | Fundamentals of Electrochemistry for Energy Applications | 3   | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |
| MATH8003 | 现代数学专题-计算类：谱方法            |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No | 公共前沿选修课，至少1学分 |
| MATH8001 | 现代数学专题-计算类：差分方法           |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |               |
| MATH8002 | 现代数学专题-计算类：有限元方法          |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |               |
| MATH8004 | 现代数学专题-计算类：最优化            |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |               |
| MATH8005 | 现代数学专题-分析类：动力系统           |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |
| MATH8008 | 现代数学专题-分析类：摄动理论           |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |
| MATH8006 | 现代数学专题-分析类：偏微分方程          |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |
| MATH8007 | 现代数学专题-分析类：傅里叶分析、复分析、小波分析 |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |
| MATH8010 | 现代数学专题-离散类：现代组合技术与算法      |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |               |

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|----------|----------------------|--|-----|---------------|-----------|------|------|
| MATH8009 | 现代数学专题-离散类：网络科学      |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| MATH8011 | 现代数学专题-离散类：组合设计与纠错码  |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| MATH8012 | 现代数学专题-离散类：代数与密码     |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| STAT8001 | 现代数学专题-随机类：高等随机过程    |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| STAT8002 | 现代数学专题-随机类：随机矩阵      |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| STAT8004 | 现代数学专题-随机类：随机优化      |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| STAT8003 | 现代数学专题-随机类：现代统计      |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| ASTR8103 | 现代物理与天文专题（天文类）：恒星和星系 |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| ASTR8404 | 现代物理与天文专题（天文类）：天文观测  |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |

|          |                          |  |     |               |           |      |      |
|----------|--------------------------|--|-----|---------------|-----------|------|------|
| ASTR8203 | 现代物理与天文专题（天文类）：宇宙学       |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| ASTR8304 | 现代物理与天文专题（天文类）：大规模数值模拟   |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| PHY8312  | 现代物理与天文专题（量子类）：量子计算与量子模拟 |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| PHY8311  | 现代物理与天文专题（量子类）：量子材料物理    |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| PHY8210  | 现代物理与天文专题（量子类）：微纳光学      |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| PHY8211  | 现代物理与天文专题（量子类）：量子信息      |  | 0.5 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |
| PHY8104  | 现代物理与天文专题（交叉类）：统计物理      |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |

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|----------|-------------------------|--|-----|---------------|-----------|------|------|
| PHY8105  | 现代物理与天文专题（交叉类）：软物质物理    |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8106  | 现代物理与天文专题（交叉类）：生物物理     |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8107  | 现代物理与天文专题（交叉类）：非线性物理    |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8405  | 现代物理与天文专题（粒子与核物理类）：强激光  |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8509  | 现代物理与天文专题（粒子与核物理类）：粒子物理 |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8510  | 现代物理与天文专题（粒子与核物理类）：新物理  |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| PHY8511  | 现代物理与天文专题（粒子与核物理类）：核物理  |  | 0.5 | 中文 in Chinese | 秋季 Fall   | 否 No | 否 No |
| CHEM9102 | 化学前沿专题：化学生物学            |  | 1   | 中文 in Chinese | 春季 Spring | 否 No | 否 No |

|  |          |              |  |   |               |           |      |      |  |
|--|----------|--------------|--|---|---------------|-----------|------|------|--|
|  | CHEM9105 | 化学前沿专题：材料化学  |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | CHEM9103 | 化学前沿专题：合成化学  |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | CHEM9104 | 化学前沿专题：新能源化学 |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | BIO8004  | 生命科学前沿：脑科学   |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | BIO8005  | 生命科学前沿：基因编辑  |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | BIO8006  | 生命科学前沿：表观遗传学 |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |
|  | BIO8007  | 生命科学前沿：合成生物学 |  | 1 | 中文 in Chinese | 春季 Spring | 否 No | 否 No |  |