# Heating, Gas, Ventilation and Air Conditioning Engineering Secondary Discipline of the International Ph.D. Student Training Program

# (Subject code: 841404 Granted: Doctor of Engineering Degree)

# Training objectives

1. Master the theoretical system of Marxism-Leninism, Mao Zedong Thought and Socialism with Chinese Characteristics and establish the core values of socialism; have a firm and correct political orientation, have a spirit of patriotism and actively contributes to the country's economic construction and social development; and abide by the laws and good moral character.
2. Master the broad basic theory and systematic professional knowledge of the discipline, master the current situation and trend of science and technology, and master modern experiment, design methods and research skills.
3. Have the courage to innovate in the spirit of science and independent scientific research ability, master and use a foreign language skillfully.
4. With a healthy body, a healthy mental and perfect personality.
5. To cultivate high-level talents capable of teaching, researching, designing, managing or related engineering and technical work in the fields of HVAC, artificial environment, building energy conservation and construction energy development and utilization.

# 二、Training methods

1. The cultivation of doctoral students implements the supervisor responsibility system or the mentor-based steering group responsibility system.
2. The cultivation of doctoral students mainly focuses on scientific research, focusing on the independent training of scientific research, teamwork and ability of scientific and technological innovation.
3. The cultivation of doctoral students is divided into curriculum learning stages and thesis writing stages. The two stages of work can be divided into segments, parallel or crossed.
4. The doctoral course is subject to a credit system and must complete the required credits before applying for a defense.
5. Doctoral students must complete the dissertations independently under the guidance of a supervisor, including publishing academic papers and writing dissertations.

# 三、Training years

1. Full-time doctoral students' training period of 3 to 4 years, more than 4 years must submit a post-graduate application deadline, and a clear deadline for graduation. Full-time doctoral students in the school for a maximum period of not more than six years (including off time).
2. In-service doctoral students with a 5-year training period, more than 5 years must submit a post-graduate application for graduate school, and a clear deadline for graduation. In-service doctoral students in the school for a maximum period of not more than eight years.
3. For outstanding doctoral students can apply for early graduation, with specific reference to "Shenyang JianZhu University graduate student advance dissertation defense relevant provisions," the implementation of the relevant provisions.

# 四、Discipline and research field

1. **Building environmental safety and control**

Internal environmental control technologies and evaluation methods for buildings, vehicles and underground structures, including thermal comfort, air quality and CFD simulation evaluation techniques; personnel health and internal relations with the indoor environment; pollutant monitoring and purification technologies in all kinds of artificial environments; the spread of pollutants and the identification of source of transmission and prevention and control technology; building environment equipment in public health emergencies, contingency strategy personnel protection.

1. **Study on Theory and Technology of Phase Change Energy Storage**

Mainly around the phase transition and chemical reaction energy storage in the field of building energy efficiency and HVAC in-depth study, explore new theories and new technologies. The main performance of phase change energy storage materials, phase change materials and building materials compatibility, phase transition heat transfer mechanism and system thermal performance, application of phase change building components, application of phase change energy storage components, phase change storage component and building thermal process of non-linear thermal integration technology, phase change energy storage in the construction of the application, phase change energy storage and renewable energy system optimization and integration of technology and other aspects of research.

1. **Climate adaptation building system and natural regulation technology**

Based on the climate response characteristics of building systems, research and development of basic theory of natural indoor environment regulation technology and sustainable building technology; evaluation method of adaptive comfort of passive solar building and indoor environment health effect; analysis of ancient Chinese architecture technology system .

1. **Renewable composite energy construction technology and equipment**

Solar heat collector theory and heat collection equipment development technology, research solar thermal synthesis conversion and energy utilization theory and technology, research solar energy and other renewable energy and traditional energy composite solar energy integration theory and technology, research and development of various heat pump and heat pump theory and equipment development technology, research solar energy Energy storage theory and equipment development technology, large-scale use of solar energy storage technology.

# Credit requirements and course settings

1. **Credit requirements**

Doctoral programs are based on the deepening and expansion of master's programs, including political, cultural, moral, foreign language and professional skills. PhD programs consist of degree courses, compulsory courses, elective courses and academic activities. The total credits are not less than 14 credits, including not less than 4 credits for degree courses, not less than 6 credits for compulsory courses, not less than 2 credits for electives, 18 hours for each credit hour, and 48 hours per credit point for public foreign languages. Academic activities of not less than 2 credits, academic activities include: participation in academic conferences, academic reports and listening to academic lectures, a total of 5 academic activities count 1 credit, each academic activity of not less than 4 hours.

The course setting is shown in the attached table.

1. **Curriculum (See schedule)**

# 六、Course learning

Doctoral students should follow the training plan developed by the tutor for course study and complete the prescribed credits. Assessment and score records with specific reference to "Shenyang JianZhu University postgraduate assessment and results management approach" implementation.

Degree courses, compulsory courses are exams, classroom lectures conducted; elective courses is to examine the course, you can use classroom teaching or practice, experimental teaching and other ways; academic activities are done under the guidance of a supervisor or subject. To attend the academic conference should keep the meeting notice or invitation, together with the contents of the meeting, signed by the instructor endorsement after the graduate teaching secretariat. To do academic reports or choose to listen a academic lectures, there should be written records, signed by the instructor postgraduate teaching secretariat. Doctoral students must do at least two academic reports within the scope of their subject during the course of their studies, and encourage doctoral candidates to attend certain academic lectures on humanities, social sciences and economics and management. Academic activities credits recorded and managed by the teaching secretary.

# 七、Thesis

1. **Literature reading**

The reading of the main reference should be 100 or more, of which not less than one half of foreign information, reference literature published in the last five years generally not less than one-third of the literature, and must have published in the literature within two years. Teaching materials, technical standards, product samples and other general should not be listed as a reference.

1. **Topic selection and opening report**

The topics of doctoral dissertations should be based on the comprehensive reflection of the development frontier and the latest research results of the subject and related fields, and should be selected for research projects of great significance to the national economy, scientific and technological progress and social development.

Ph.D. thesis dissertation completed before the end of the third semester. The referee unit degree appraisal sub-committee shall organize the 5-7 panel opening expert review panel to hold the opening meeting report. The contents of the opening report include: the source of the subject and the purpose and significance of the research; analysis of the development and research status at home and abroad; the main research content; research programs, schedule and expected results; innovation, the key issues to be solved and economic or social benefits; the main references and so on. Subjects who have passed the opening report may enter the dissertation stage; If the opening report is not passed, they must be revised in accordance with the opinions of the panel of experts, and in the next three months for the second question. The second dissertation dissertation report has not yet passed, will be "Shenyang JianZhu University doctoral student status management approach" the relevant provisions of the deal. The topic report should include relevant teachers and graduate students; Interdisciplinary thesis topics should be invited to participate in the relevant disciplines. In the course of the dissertation research, if there is a major change in the dissertation topics, the report of the topic selection should be reopened. After the reopening of the essay, the deadline for submission of the dissertation must be over 10 months before the deadline for submission of the dissertation.

1. **Thesis writing**

PhD dissertations must be a systematic and complete scholarly dissertation that summarizes the scientific work done during a Ph.D. study. The contents of a doctoral dissertation should be the cutting-edge scientific issues or engineering key technologies in the field of research, and must also form innovative achievements with independent intellectual property rights in the research fields during the Ph.D. period. Doctoral dissertations should be clear concept, rigorous structure, structured, accurate calculation, chart specification, the conclusion is correct.

Doctoral dissertations are all computer typesetting, printing, the specific format with reference to "Shenyang Jianzhu University graduate dissertation writing norms", and after the defense by standard cover binding.

The doctoral dissertation is written in Chinese. If written in a foreign language, you must submit a complete Chinese translation. The subject text dissertation part of the text is not less than 60,000 words, of which the introduction of some 10,000 words or so.

1. **Mid-term examination**

The doctoral dissertation to be carried out in the mid-term examination, that is, a dissertation thesis about a year after the time. The assessment includes: the progress of the research results obtained, the progress of the paper work, the problems and the next stage of the specific work plan. The mid-term inspection work is organized by the degree assessment sub-committee organized by the relevant disciplines composed of 5-7 assessment team, held a dissertation mid-term inspection meeting on the work of doctoral dissertation progress inspection. Through the mid-term examiners can continue to work on dissertations.

1. **Publishing academic papers**

PhD students in addition to the completion of dissertations, at school, before the defense must be in this subject at home and abroad designated journals or academic conference with the first author (at least one) or second author (Tutor must be the first author) published a number of dissertations related to academic papers (The first signatory must be "Shenyang Jianzhu University"), and achieve the Shenyang Jianzhu University for heating, gas, ventilation and air conditioning engineering secondary discipline doctoral academic papers published quantitative indicators.

1. **Dissertation review**

Upon completion of doctoral dissertation recommended by the instructor, may apply to participate in the dissertation evaluation. Experts from relying on degree assessment committee to employ experts to carry out dissertation evaluation, each paper review experts require not less than 5 people, and are doctoral tutor, of which not less than two-thirds of the experts outside the school. According to the experts' comments, all the papers that reach the level of doctoral degree are expected to apply for pre-defense according to the opinions of experts. If one of the experts reviews comments that they did not reach the level of doctoral degree, the scope of expert review should be expanded, and then the degree assessment committee will discuss and decide whether to participate in the pre-defense. More than one-third of expert opinion comments that the dissertation did not reach the level of doctoral degree, is not allowed to participate in pre-defense, subject to reapply for a dissertation review after six months of revising the dissertation.

1. **Dissertation pre-defense**

PhD dissertation through expert review, you can apply to participate in dissertation pre-defense. The pre-respondent is an important part of examining the contents of the doctoral dissertations and ensuring the quality of the doctoral dissertations. The doctoral dissertation defense is organized by the discipline where it is located, specific in accordance with "Shenyang Jianzhu University doctoral dissertation pre-defense procedures and requirements" implementation. Through the pre-respondent doctoral dissertation, must also participate in the thesis by the Graduate Institute of Dissertation similarity test, pass the blind trial of the dissertation.

1. **Degree thesis blind review**

The doctoral dissertation is required to participate in the examination of academic degree after the pre-defense and similarity detection. The graduate school employs external experts to conduct the double-blind review work, each of whom has a requirement of not less than three persons, all of whom are doctoral supervisors. Blind review opinion is considered to achieve the doctoral degree level of the thesis, according to the expert opinion revised to participate in the thesis defense; In the opinion of blind review, one person thinks that the paper has not reached the level of doctor's degree. After the revision of the dissertation, the graduate school shall organize double blind review again until it is adopted. More than a third of blind review's opinion is that the paper does not reach the level of doctoral degree and is not allowed to participate in the thesis defense. It is necessary to apply for an illiteracy trial again after half a year of revising the thesis.

1. **Dissertation defense**

The doctoral dissertation can apply for a defense after the pre-defense, similarity detection and blind review. The dissertation defense is a comprehensive assessment of the scientific research work of doctoral students and the level of the dissertation. It is an important procedure for applying and conferring a doctorate degree. The dissertation defense is organized by the degree assessment committee, specific in accordance with "Shenyang Jianzhu University doctoral dissertation defense procedures and requirements" implementation.

**Heating, Gas, Ventilation and Air Conditioning Engineering in the secondary disciplines of international doctoral programs**

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| **Course category** | **Course number** | **Course Title** | **Hours** | **Credit** | **Semester** | **Assessment method** | **Remarks** |
| Degree courses |  | Chinese Culture | 36 | 2 |  | Examination | Required |
|  | Chinese Language | 96 | 2 |  |
| Compulsory courses |  | Mathematical Inverse Problem | 36 | 2 |  | Test or Examination | Required |
|  | Engineering Mass Transfer | 36 | 2 |  |
|  | HVAC system numerical simulation | 36 | 2 |  |
| Elective course |  | PEclass | 18 | non-credit |  | Test | Required |
|  | Second Foreign Language (English) | 72 | 2 |  | Minority language must be selected |
|  | HVAC Intelligent Control System | 36 | 2 |  | Electives |
|  | Heat Conversion and Utilization | 36 | 2 |  |
|  | Analysis Methods of Building Indoor Environment | 36 | 2 |  |
|  | Research and Development of New HVAC Technology | 36 | 2 |  |
|  | Traditional Residential Buildings | 36 | 2 |  |
| Academic activities | Academic lecture (public on campus) | Not less than 4 hours each time. | Cumulative 5 count 1 credit. | Unlimited | Test |  |
| Academic conference (participating in national and submitting papers) |