



研究生课程教学大纲

Syllabus for the Course of Master Program

课程名称：工程技术研究方法导论

(Course Name): Introduction to engineering research

所在院(系、所): 中德学院

School (Dept./Institute): Sino Germany College

适用专业: 机械和车辆工程

(Major): Mechanical and Vehicle Engineering

大纲撰写负责人: 林松

Coordinator: Prof. Dr. Lin Song

填表日期: _____

Date: _____

学科、专业委员会主任(签字): _____

Director of Academic Committee (Signature): _____

同济大学研究生院培养处制

课程名称(Course Name in Chinese): 工程技术研究方法导论
英文名称(Course Name in English): Introduction to engineering research
开课单位(School or Dept.): 中德学院(Sino Germany College)
开课学期(Semester): 第一学期(First Semester)
课内学时(Contact hours): 36 小时(36 Hours)
学分要求(Credits): 2 学分(2 Points)
教学方式(Teaching Method): 讲授、练习(Lecture, Exercise)
授课语言(Language): 中文、德语(Chinese, German)
授课层次(Teaching Levels): 研究生(Master)
人数要求(Number of Students): (请用宋体 5 号字填写)
适用专业(Major): 机械和车辆工程(Mechanical and Vehicle Engineering)
考核方式(Assessment): 闭卷考试(Klausur)
预修课程(Prerequisite): 机械原理、机械设计(Mechanism design, Machine element)

一、教师简介

1. Profile and Contact Way of the Teachers

林教授长期在多技术集成产品研发方法、机构传动系统设计、装备自动化和智能化、以及技术系统可靠性方面从事教育和研究工作，在德国工作期间，著有专著《机构模糊位置综合》，两款由他研制的机构被命名为“林氏机构”(www.dmg-lib.org)。此外还承担了德意志研究联合会(DFG)资助的特殊研究领域(SFB)跨学科综合研究项目和其他中短期项目，同时还作为中国机械工程学会高级会员、机构学专业委员会理事活跃在学术界。

Professor Lin works, for a long time, in the fields of multi-technology integrated product development methods, transmission mechanism design, automation and intelligence of equipment and reliability of technical system. He is the author of the book "Mechanism Synthesis for the Fuzzy Motion Generation". Two transmission mechanisms designed by him are named with his name in Germany (www.dmg-lib.org). He also undertakes interdisciplinary research projects in the special research field (SFB) funded by German research federation (DFG) and other short-term projects. Meanwhile as a senior member of Chinese Mechanical Engineering Society and director of the technical committee of mechanism, Prof. Lin is active in academia.

二、课程简介

2. Course Description

同济大学中德学院开设的“工程技术研究方法导论”课程，为机械和车辆工程类专业的研究生必修基础课。课程主要讲授：概论，工程技术研究的基础知识，工程技术研究的基本方法，工程技术研究的设计，研究项目，讲演报告，学术论文撰写，研究生论文的撰写，技术文件的撰写，学术道德与规范。

The course “Introduction to Engineering Research” in CDHK is aimed for the students majored in Mechanical and Vehicle Engineering as a compulsory basic course. The course includes: introduction, Basic knowledge of engineering technology research, basic methods engineering technology research, design of engineering technology research, research Project, reports and lectures, writing of the academic article, writing of the graduate thesis, writing technical documents and Academic ethics and norms.

三、教学目标与要求（请用宋体 5 号字填写）

3. Course Objective and Requirement

1. 目标：

通过对本课程学习，力求使学生掌握：

- (1) **原理和过程：**科学研究的一般规律和基本原理，工程技术研究的作用、范围、主要进程、研究内容和研究形式。
- (2) **方法和技能：**工程技术研究项目的组织和管理，包括研究项目的前期准备、研究课题的提出、研究内容的提炼、技术路线的拟定、研究阶段的规划和研究成果的验收。
- (3) **实践和应用：**工程技术研究成果的总结，包括研究结果的整理、技术文件的建立、成果转化和推广应用的前期工作。

2. 要求：

- (1) 学生具备文献查询的初步能力和方法，了解或参加过科研项目，基本把握自己的研究领域的动向；
- (2) 本课程重点是研究方法，课外必须阅读所从事专业领域的相关文献，所有配套练习要求结合自己的研究课题完成。
- (3) 课程考评成绩包括两个方面：基本方法的应用（笔试）和科研项目的设计（答辩）。

1.Goals:

The students should master the followings by the end of the course:

- (1) **Principles and processes:** general laws and the basic principles of scientific research, the function of engineering technology research, category, main process, and research contents and forms;
- (2) **Methods and skills:** organization and management of engineering research project, including the preparation of research projects, proposals research topics, research refining, development of technology roadmap, acceptance of the results of studies

and research planning stage;

- (3) **Practice and application:** summary of engineering research results, including the arrangement of research results, the establishment of technical documentation, preliminary work for transformation of achievements and popularization of applications.

2. Requirements:

- (1) **Students** should develop the skills and methods for literature inquiry, know research projects well or participate in research projects, and grasp the trends in the fields of their research
- (2) **The course** focuses on research methods, students should read relevant literature in the professional field. All supporting practice should be completed in combination with their own researches.
- (3) **Evaluation** results of the Course include two aspects: the application of the basic methods (written) and research design (Project reply).

四、课程内容与学时分配

4. Course Schedule (Content and Contact Hours Assigned)

- 第一章 概论 (3学时)
- 1.1 科学研究与工程技术研究
 - 1.2 程技术研究的发展
 - 1.3 程技术研究的作用
 - 1.4 课程的目标与内容
- 第二章 工程技术研究的基础知识 (3 学时)
- 2.1 工程技术研究的全过程
 - 2.2 影响工程技术研究的因素
 - 2.3 工程技术研究的模式
 - 2.4 工程技术研究的阶段
 - 2.5 工程技术研究的方法
- 第三章 工程技术研究的基本方法 (6 学时)
- 3.1 灵感和逻辑思维方法
 - 3.2 分析与综合的方法
 - 3.3 抽象与具体的方法
 - 3.4 分解与合成的方法
 - 3.5 独立工作和团队合作
 - 3.6 研究环境和工具
- 第四章 工程技术研究的设计 (6 学时)
- 4.1 工程技术研究设计类型
 - 4.2 工程技术研究设计原则

- 4.3 工程技术研究设计步骤
- 4.4 工程技术研究设计内容
- 4.5 工程技术研究设计实例
- 第五章 研究项目（3 学时）
 - 5.1 前期准备
 - 5.2 立项依据
 - 5.3 研究内容
 - 5.4 研究方案
 - 5.5 研究规划和实施
 - 5.6 项目验收
- 第六章 讲演报告（3 学时）
 - 6.1 报告的风格和魅力
 - 6.2 报告的组成部分
 - 6.3 报告准备
 - 6.4 做好报告的基本技巧
- 第七章 学术论文撰写（3 学时）
 - 7.1 论文的模式
 - 7.2 学术论文的规划和数据准备
 - 7.3 科研内容和结果的呈现
 - 7.4 科研方法和科学结论的提炼
 - 7.5 科研成果的交流和应用
- 第八章 研究生论文的撰写（3 学时）
 - 8.1 版权使用授权和原创性声明
 - 8.2 研究生论文的形式与结构
 - 8.3 研究生论文的主要内容
 - 8.4 研究生论文的写作规范
- 第九章 技术文件的撰写（3 学时）
 - 9.1 技术文件的有关规定
 - 9.2 技术文件撰写的步骤和技巧
 - 9.3 用户使用及安全说明
 - 9.4 详细技术参数描述
 - 9.5 技术结构与功能介绍
 - 9.6 运输和安装运行指导
 - 9.7 故障与维修说明
 - 9.8 其它辅助技术文件
- 第十章 学术道德与规范（3学时）
 - 10.1 科研的社会效应
 - 10.2 科研者品格和素质
 - 10.3 科研规范
 - 10.4 避免学术造假

- Chapter 1 Introduction (3 hours)
 - 1.1 Scientific and engineering research
 - 1.2 Technology research development projects
 - 1.3 The role of engineering technology research
 - 1.4 Goals and content of the course
- Chapter 2 Engineering technology research basics (3 hours)
 - 2.1 The whole process of engineering technology research
 - 2.2 Factors affecting engineering technology research
 - 2.3 Mode for engineering technology research
 - 2.4 Stages of engineering technology research
 - 2.5 Methods in engineering technology research
- Chapter 3 Basic methods of engineering technology research (6 hours)
 - 3.1 Inspiration and logical thinking
 - 3.2 Analysis and synthesis methods
 - 3.3 Abstract and concrete ways
 - 3.4 Decomposition and synthesis methods
 - 3.5 Independent working and team work
 - 3.6 Research environment and tools
- Chapter 4 Design engineering technical research(6 hours)
 - 4.1 Design type of research engineering
 - 4.2 Design principles for research engineering
 - 4.3 Procedures of engineering design
 - 4.4 Design content of technology research engineering
 - 4.5 Engineering technology design example
- Chapter5 Research project (3 hours)
 - 5.1 Preparation
 - 5.2 Project basis
 - 5.3 Research content
 - 5.4 Research programs
 - 5.5 Research planning and implementation
 - 5.6 Project acceptance
- Chapter 6 Reports and lectures (3 hours)
 - 6.1 Style and charm of report
 - 6.2 Parts of the report
 - 6.3 Report prepared
 - 6.4 Good basic skills report
- Chapter 7 Writing of the academic article (3 hours)
 - 7.1 Paper pattern
 - 7.2 Academic planning and data preparation
 - 7.3 Presentation of scientific research contents and results

- 7.4 Research methods and refined scientific conclusions
- 7.5 Exchange and application of research results
- Chapter 8 Writing of the graduate thesis (3 hours)
 - 8.1 Copyright license and original statement
 - 8.2 Form and structure of graduate thesis
 - 8.3 Main content of graduate thesis
 - 8.4 Writing norms of graduate thesis
- Chapter 9 Writing technical documents
 - 9.1 Relevant provisions of technical documentation
 - 9.2 Steps and skills of technical documents writing
 - 9.3 Instructions for use and safety
 - 9.4 Detailed description of technical parameters
 - 9.5 Introduction of technical structure and functions
 - 9.6 Instructions of transport and installation and operating
 - 9.7 Faults and repair instructions
 - 9.8 Other assistive technology file
- Chapter 10 Academic ethics and norms (3 hours)
 - 10.1 Social effects of research
 - 10.2 The character and qualities for researchers
 - 10.3 Research norms
 - 10.4 Avoid academic fraud

五、实验及实践性环节

5. Experiment and Internship

1. 融会贯通工程技术研究原理、思维方式、和研究方法的基本训练（笔试）
 2. 结合教席科研意向撰写科研项目申请书（论文开题训练）
 3. 根据实际科研工作完成科研项目报告（论文撰写训练）
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1. Master basic training principles, ways of thinking, and research methods in engineering research (test by written)
 2. Write research program application in combination with the intention of Chairs (Dissertation Proposal Training)
 3. Complete research report according to the actual research work (thesis writing training)

六、教材（序号，编著者姓名，教材名称，出版社，版次，出版日期）

6. Textbook (No., Author / Editor, Name of the Textbook, Publishing house, no. of the edition, publishing year)

林松： 同济大学研究生课堂教学教案“工程技术研究方法导论（PPT）”，上海同济大学中德学院，2015

Lin Song: Lesson plan“Introduction to engineering research（PPT）” for Master in Tongji University, Sino Germany College of Tongji University, 2015

主要参考书（序号，编著者姓名，教材名称，出版社，版次，出版日期）

References (No., Author / Editor, Name of the book / material, Publishing house, no. of the edition, publishing year)

1. Armin Töpfer: Erfolgreich Forschen, Springer Gabler , 2012

2. Friedrich Rost: Lern- und Arbeitstechniken für das Studium, Springer Fachmedien Wiesbaden 2012

3. Ulrike Leopold-Wildburger, Jörg Schütze: Verfassen und Vortragen, Springer-Verlag Berlin 2010

4. Barbara Hey, Präsentieren in Wissenschaft und Forschung, Springer-Verlag Berlin 2011

5 同济大学学位办公室：同济大学研究生学位论文写作规范（试行），2011年11月修订版，2011