

## 课程大纲

### COURSE SYLLABUS

1.	<b>课程代码/名称</b> <b>Course Code/Title</b>	微加工与微系统 Microfabrication and Microsystems				
2.	<b>课程性质</b> <b>Compulsory/Elective</b>	专业课/Elective				
3.	<b>课程学分/学时</b> <b>Course Credit/Hours</b>	3/48				
4.	<b>授课语言</b> <b>Teaching Language</b>	英文 English				
5.	<b>授课教师</b> <b>Instructor(s)</b>	胡程志/Chengzhi Hu				
6.	<b>是否面向本科生开放</b> <b>Open to undergraduates or not</b>	是 Yes				
7.	<b>先修要求</b> <b>Pre-requisites</b>	研究生：无 本科生：本科生：ME307 控制工程基础或者 ME307-16 控制工程基础 Fundamentals of Control				
8.	<b>教学目标</b> <b>Course Objectives</b>	<p>微加工与微系统是机械与能源工程系本科生与研究生专业选修课。其他学科专业具备相应基础知识且有兴趣的学生可以选修。本课程的先修课程有化学原理 B 与大学物理 B(下)。</p> <p>本课程的主要任务是通过各个教学环节及教学手段使学生掌握常用面向微机电系统，微机器人，微电子器件，微流体器件，芯片实验室，生物传感器等微系统工作原理，设计准则，加工工艺与方法。培养学生设计加工新型微传感器，微执行器，微系统的基本能力。为以后从事微器件与微系统等方向的工程技术工作、科学研究工作以及开拓新技术领域奠定基础。</p> <p>Microfabrication and Microsystems is a major elective course for undergraduate and graduate students in the Department of Mechanical and Energy Engineering. Students from other majors who have appropriate basic knowledge and are interested can take courses. The prerequisite courses are General Chemistry B and General Physics B.</p> <p>The objective of this course is to teach the working principles, design, and processing techniques of microsystems that are commonly used as micro-electromechanical systems, microrobots, microelectronic devices, microfluidic devices, lab-on-a-chips, biosensors, etc. Meanwhile, it is obligated to train students the basic capabilities in design and process of new microsensors, microactuators, and other microsystems. The course will also lay a foundation for future engineering, scientific research and development of new technologies in the direction of microdevices and microsystems.</p>				
9.	<b>教学方法</b> <b>Teaching Methods</b>	讲授/Lectures				
10.	<b>教学内容（需要写到 section 16）</b> <b>Course Contents</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Section 1</b></td> <td>微系统概述及工作原理 Overview and working principles of microsystems</td> </tr> <tr> <td><b>Section 2</b></td> <td>微系统设计及制造的工程科学 Engineering Science in Microsystem</td> </tr> </table>	<b>Section 1</b>	微系统概述及工作原理 Overview and working principles of microsystems	<b>Section 2</b>	微系统设计及制造的工程科学 Engineering Science in Microsystem
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	Design and Manufacturing
<b>Section 3</b>	微系统设计中的工程力学 Engineering Mechanics in Microsystem Design
<b>Section 4</b>	微型化中的按比例缩小法则 The scaling law in miniaturization
<b>Section 5</b>	用于微系统的材料 Materials for microsystems
<b>Section 6</b>	微系统加工工艺-氧化, 离子注入 Microsystem processing technology - oxidation, ion implantation
<b>Section 7</b>	微系统加工工艺-化学气相沉积 Microsystem Processing - Chemical Vapor Deposition
<b>Section 8</b>	微系统加工工艺-物理气相沉积 Microsystem Processing - Physical Vapor Deposition
<b>Section 9</b>	微系统加工工艺-外延沉积、腐蚀 Microsystem processing technology - epitaxial deposition, corrosion
<b>Section 10</b>	微系统设计 Microsystem design
<b>Section 11</b>	自驱动微纳米机器人 Self-driven micro/nano robot
<b>Section 12</b>	外部驱动微纳米机器人 1 Externally driven micro/nano robot 1
<b>Section 13</b>	外部驱动微纳米机器人 2 Externally driven micro/nano robot 2
<b>Section 14</b>	微流体驱动与控制 Microfluidic manipulation and control
<b>Section 15</b>	细胞操控微流控芯片 Microfluidic chip for cell manipulation
<b>Section 16</b>	线虫微流控芯片 Microfluidic chip for nematode
<b>11. 课程考核</b> <b>Course Assessment</b>	
	<p>请在此注明：①考查/考试；②分数构成（可包含 attendance, quiz, midterm, final exam, 各项可设置一定比例，由任课教师自行决定，研究生课程及格线为 75 分）。</p> <p>出勤 Attendance 10%. 课程项目 Projects 30%. 期末报告 Final Presentation 60%.</p>
<b>12. 教材及其它参考资料</b> <b>Textbook and Supplementary Readings</b>	
	<p>Tai-Ran Hsu, MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering, Second Edition, John Wiley &amp; Sons, 2008</p> <p>Marc J. Madou, Fundamentals of Microfabrication and Nanotechnology, 2011, CRC Press</p> <p>Joseph Wang, Nanomachines fundamentals and applications, 2013, Wiley-VCH</p>