

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	软材料基础 Introduction to Soft Matter				
2.	授课院系 Originating Department	机械与能源工程系 Department of Mechanical and Energy Engineering				
3.	课程编号 Course Code	ME262				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业选修课 Major Elective Courses				
6.	授课学期 Semester	春季 Spring				
7.	授课语言 Teaching Language	英文 English				
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	韦齐和教授 Qi-Huo Wei 机械和能源工程系, Department of Mechanical and Energy Engineering weiqh@sustech.edu.cn				
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced				
10.	选课人数限额(可不填) Maximum Enrolment (Optional)					
11.	授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
	学时数	46			1-2 research talks by	48

Credit Hours

			leading researchers	
--	--	--	---------------------	--

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无。NA
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	软物质机器人,3D/4D 打印
14. 其它要求修读本课程的学系 Cross-listing Dept.	PHYSICS, ECE, CE, MAE...

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

Because of its exceptional responsiveness to various chemical and physical stimuli, intelligent soft matter has become indispensable for applications including actuators and sensors, flexible electronics, robotics, 3D/4D printing, and reconfigurable metamaterials/device components. This course will focus on introducing several important intelligent soft materials, their physical and chemical structures, the interactions between molecules and particles, the physical basis of their phase behavior and physical properties. This course will also cover some of the cutting-edge applications of smart soft materials. This course aims to prepare students with fundamental understanding stimuli-responsive soft matter for their further study and research on soft matter related subjects.

16. 预达学习成果 **Learning Outcomes**

Students taking this course will gain basic understanding of molecular/particle interactions, structures and phases, properties and their relationships for various soft materials, understand why these soft materials exhibits extraordinary responsiveness to various physical and chemical stimuli and why these properties are desired in practical applications. Students equipped with this basic knowledge will be well positioned to participate research in related fields, read and write on topics of soft matter.

17. 课程内容及教学日历 (如授课语言以英文为主, 则课程内容介绍可以用英文; 如团队教学或模块教学, 教学日历须注明主讲人)

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Chapter 1 Introduction (5 credit hours)
(a) What is soft matter; (b) Basic thermal physics; (c) Phase diagrams and transitions

Chapter 2 Forces, assembly, and mechanical behavior (4 credit hours)
(a) Forces between molecules and particles; (b) Aggregation and assembly; (c) Viscous, elastic and viscoelastic behavior

Chapter 3 Liquid crystals (12 credit hours)
(a) What is a liquid crystal; (b) Liquid crystal phases; (c) Distortions and defects; (d) Boundary effects; (e) Responsiveness to external stimuli; (f) Applications

Chapter 4 Polymers (15 credit hours)
(a) Introduction; (b) Polymer solutions; (c) Random walks, polymer chains and chain statistics; (d) Rubber elasticity; (e) Viscoelasticity of polymers and reptation model; (f) Liquid crystal elastomers; (g) Gels; (h) Theory for gelation; (i) Applications (sensing, actuation, robotics, 4D printing and etc)

Chapter 5 Colloidal dispersions (12 credit hours)
(a) Stokes law and Brownian motion of single particles; (b) Interactions between colloidal particles; (c) Stability and phase behavior of colloids; (d) Active matter and microrobotics.

18. 教材及其它参考资料 **Textbook and Supplementary Readings**

Textbook: (1) Soft Condensed Matter by Richard A.L. Jones; (2) Lecture notes by the instructor

References : (1) Fundamentals of Soft Matter Science by Linda Hirst; (2) Soft Matter Physics, by Maso Doi

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance	Attendance is required			
课堂表现 Class Performance		5		As extra credit for grades
小测验 Quiz	No			
课程项目 Projects		10		
平时作业 Assignments		30		
期中考试 Mid-Term Test		30		
期末考试 Final Exam		30		
期末报告 Final Presentation	No			
其它 (可根据需要 改写以上评估方 式) Others (The above may be modified as necessary)				

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading
- B. 二级记分制 (通过/不通过) Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

机械与能源工程系教学委员会