课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	MAE5019 微纳力学 Micro and Nano Mechanics
2.	**课程性质** **Compulsory/Elective**	专业选修课 Subject-Elective
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	英语 English
5.	**授课教师** **Instructor(s)**	待定
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 Yes
7.	**先修要求** **Pre-requisites**	MA102B 高等数学（下）A Calculus II A

8. 教学目标
Course Objectives

过去，微纳米尺度力学的研究主要源于传统力学方法的基础性兴趣。这种动机正在改变，因为微纳米物体不再仅仅满足人们对科学的好奇心，他们更是工程组件。本课程将介绍在微纳米级应用工程力学所需的先进概念和方法。具体来说，1.学生将获得在微/纳米力学中进行自主学习所需的背景知识。 2.学生将能够将基本和先进的力学概念和方法应用于纳米技术。3. 学生将会了解微纳米力学进展情况。课程将重点关注微纳米级的技术和力学研究领域。受这一领域影响的技术包括传感器，纳米电子学，纳米光学，纳米机器和纳米材料设计

In the past, investigations into mechanics at the micro/ nanoscale were motivated by interest in the fundamental basis of more traditional Mechanics methods. This motivation is changing because micro / nanoscale objects are no longer just subjects of scientific curiosity; they are themselves engineering components. This course will introduce advanced concepts and methods needed to apply Engineering Mechanics at the micro/nanoscale. Specifically, 1.Students will gain the background needed to pursue independent study in Micro / nanomechanics. 2. Students will be able to apply basic and advanced Mechanics concepts and methods to problems in Nanotechnology.3. Students will learn the state of ongoing developments in micro/ nano mechanics. Classes will focus on technology and mechanics research areas at micro/ nanometer scale. Technologies impacted by this area include sensors, nanoelectronics, nanooptoelectronics, nanomachines, and designer materials.

9. 教学方法
Teaching Methods

讲授 lecture

10. 教学内容
Course Contents

Section 1	Atomic force microscopy (AFM) (3hrs)
Section 2	Nanoindentation (3hrs)

	Section 3	*In situ* SEM experimentation (3hrs)
	Section 4	Advanced nanomaterials (4hrs)
	Section 5	Mechanics of biomaterials (3hrs)
	Section 6	Multifunctional materials (4hrs)
	Section 7	Processing and manufacturing techniques (4hrs)
	Section 8	Midterm exam（1hrs）
	Section 9	Overview of experimental fracture mechanics (3hrs)
	Section 10	Overview of fatigue experiments (3hrs)
	Section 11	small scale polymeric, and composite materials (4hrs)
	Section 12	Spectroscopic methods (4hrs)
	Section 13	Characterization techniques (4hrs)
	Section 14	Mechanics in emerging applications (2hrs)
	Section 15	Overview of industrial applications (2hrs)

11. 课程考核
Course Assessment

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

1.no final exam

2. 出勤 Attendance 10%
平时作业 Assignments 30%
期中考试 Midterm exam 30%
期末报告 Final Presentation 30%

3.There is no difference between undergraduate and graduate students.

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

CLELAND, A N. *Foundations of Nanomechanics: From Solid-State Theory to Device Applications.* Berlin : Springer Verlag, 2003. 436 p. ISBN 3-540-43661-8.
LI, S. -- WANG, G. *Introduction to Micromechanics and Nanomechanics.* New Jersey : World Scientific, 2008. 500 p. ISBN 978-981-281-413-5.