《纳米材料科学与工程基础》教学大纲

课程代码: NANA 2058 课程名称: 纳米材料科学与工程基础 英文名称: Fundamentals of Nano Materials Science and Engineering 课程性质:大类基础 学分/学时: 3/54 考核方式:闭卷考试 开课学期: 第4学期 适用专业: 纳米材料与技术 先修课程: 普通物理、无机化学、高等数学 后续课程:毕业设计 开课单位: 纳米科学技术学院 课程负责人: Manuel E. Brito 大纲执笔人: Manuel E. Brito 大纲审核人:董彬 选用教材:《Fundamentals of Materials Science and Engineering》William D. Callister, Jr., 化 学工业出版社

一、课程目标

The main objective is to train students in the field of Materials Science and Engineering that forms a base for further engineering and scientific education, and prepares students for practice. The course objectives are directed to students to recognize and discuss different types of materials and materials structures, material properties and their application, with special emphasis on the relationships between internal structures and properties. At the end of this course the student should be able to:

- 1. Recognize the importance of materials in diverse practical application.
- 2. Classify and describe the materials based on their structures including crystal phase
- 3. or short-range of crystallinity/amorphous phase.
- 4. Explain the basic physical, chemical, and optical properties in synergy with their
- 5. structural properties.
- 6. Select appropriate types of materials for specific applications.
- 7. Design a workable approach to modify structure/microstructure with desired
- 8. properties.
- 9. Depict methodologies for characterization of materials that are classified in different
- 10. structural and chemical categories.

二、教学内容

- 1. Atomic Structure and Interatomic Bonding
- 2. Structures of Metals and Ceramics
- 3. Imperfections in Solids
- 4. Diffusion
- 5. Mechanical Properties
- 6. Phase Diagrams
- 7. Phase Transformations

8. Electrical Properties

9. Optical Properties

三、课程成绩

1. 考核方式

课程目标	考核内容	考核方式
Use basic knowledge in materials science and engineering to analyze and quantitatively solve complex problems in the field of nanotechnology. (支撑毕业要求指标点 1-2)	运用数学和化学、材料学、 生物学、物理学、力学等自 然科学基础知识和材料工 程专业知识的能力。	随堂测验、课后作业以 及闭卷考试
Use basic knowledge in materials science and engineering to test and optimize solutions of complex problems in the field of nanotechnology. (支撑毕业要求指标点 1-3)	运用所学知识确定问题关 键因素并进行检验优化的 能力	随堂测验、课后作业以 及闭卷考试
Being able to apply the materials science approach to conduct comprehensive analysis of complex problems in the field of nanotechnology. (支撑毕业 要求指标点 2-2)	文献调研能力,实验设计能 力,对实验安全和规范操作 的了解,创新意识及设计理 念。	课堂作业、课后作业以 及闭卷考试
Based on materials science scientific and engineering principles, the graduated can propose research solutions to complex problems in the field of nanotechnology. (支撑毕业要求指标点 4-1)	能基于科学原理,针对纳米 科技领域的复杂问题提出 研究方案。	课堂作业、课后作业以 及闭卷考试

2. 成绩评定方法

	作业及随堂测试权重	期中考试权重	期末考试权重
课程目标1	0.3	0.3	0.1
课程目标 2	0.3	0.3	0.1
课程目标3	0.2	0.2	0.1
课程目标 4	0.2	0.2	0.7

3. 课程目标(支撑毕业要求指标点)达成度评价方法

课程目标 n 达成度 =(作业及随堂测试平均分*作业及随堂测试权重*20%+期中平均分*期中权重*30%+期末 平均分*期末权重*50%)/(100*平时权重*20%+100*期中权重*30%+100*期末权重*50%)

4. 评分标准

课程目标	90-100	75-89	60-74	0-59
	(优秀)	(良好)	(及格)	(不及格)
Use basic knowledge	The student	The student	The student	The student lacks
in materials science	acquired basic	acquired basic	acquired basic	of basic
and engineering to	knowledge that	knowledge that	knowledge that	knowledge and
analyze and	enable him/her to	enable him/her to	enable him/her to	understanding in
quantitatively solve	innovatively	conceptualize	classically	materials science
complex problems in	conceptualize	solutions to	conceptualize	and engineering.
the field of	solutions to	complex problems	solutions to	and engineering.

nanotechnology. (支	complex problems	in terms of	complex problems	
撑毕业指标点 1-2)	in terms of	materials science	in terms of	
	materials science	and engineering.	materials science	
	and engineering		and engineering	
	The student	The student	The student	
Use basic knowledge in materials science	acquired basic	acquired basic	acquired basic	
	knowledge in	knowledge in	knowledge in	
	materials science	materials science	materials science	The student lacks
and engineering to test and optimize	and engineering	and engineering	and engineering	of basic
•	that enable	that enable	that enable	knowledge and
solutions of complex	him/her to propose	him/her to non-	him/her to propose	understanding in
problems in the field	highly innovative	classical; propose	classical solutions	materials science
of nanotechnology.	solutions to	solutions to	to complex	and engineering.
(支撑毕业指标点 1-	complex problems	complex problems	problems in the	
3)	in the field of	in the field of	field of	
	nanotechnology.	nanotechnology.	nanotechnology.	
Being able to apply	The student can	The student can	The student can	
the materials science	apply the materials	apply the materials	apply the materials	
approach to conduct	science approach	science approach	science approach	The student lacks
comprehensive	to excel in	to conduct	to normally	of basic
analysis of complex	conducting	comprehensive	conduct	knowledge and
problems in the field	comprehensive	analysis of	comprehensive	understanding in
of nanotechnology.	analysis of	complex problems	analysis of	materials science
(支撑毕业指标点 2-	complex problems	in the field of	complex problems	and engineering.
2)	in the field of	nanotechnology.	in the field of	
	nanotechnology.		nanotechnology.	
Based on materials	The student based	The student based	The student based	
science scientific and	on materials	on materials	on materials	
engineering	science principles	science principles	science principles	The student lacks
principles, the	can propose highly	can propose non-	can propose	of basic
graduated can propose	innovative	classical research	classical research	knowledge and
research solutions to	research solutions	solutions to	solutions to	understanding in
complex problems in	to complex	complex problems	complex problems	materials science
the field of	problems in the	in the field of	in the field of	and engineering.
nanotechnology. (支	field of	nanotechnology.	nanotechnology.	
撑毕业指标点 4-1)	nanotechnology.	nanoteennology.	nanoteennology.	