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

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