

理學院

107 學年度第一學期模組化課程

材料與礦物科學導論

Introduction to Materials and Mineral Sciences

授課教師：

簡淑櫻

國立成功大學理學院

課程類別	學分數	選必修	開課人數	開課日期及上課時間	上課地點
講義	1	選修	30	2018/08/13(一)-2018/08/17(五) 下午 14:00-17:00	

先修課程或先備能力：

無

建議修課年級：

不設限

建議修課學生背景：

適合各領域學生修習

教學方法：

講授 90 %、報告/討論/測驗 10 %

評量方式：

問題考試 Quiz 20 %、科學報告 70 %、出席率 Attendance 10%

補充說明：

Quiz is held in the beginning 15 minutes of each day or may be arranged through the course according to students' learning progress. Assignments associated with topics will be given right after each topic is done. A final report (assignments, briefing acquired knowledge and course/topic feedback) will be asked to submit in a week time after the end of the course.

學習規範：

無

課程概述：

A big variety of properties occurs in materials due to their intricate patterns composed of atoms and molecules over many different length scales. The complicated microstructures result in notable physical properties, leading to electrical, optical and mechanical behaviors related to both scientific and technological applications. This course provides underlying knowledge for students to cope with subjects such as Materials Science, Mineral Sciences or other physical sciences (like Physics and Chemistry) in subsequent years.

Five topics will be explored in this course:

I. Atomic Structures of Materials: the atomic structure of any material play an important role in its physical and chemical properties. Any property can be determined if one knows where the atoms are

理學院

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and what they are.

II. Diffraction: X-rays is an ideal radiation source to investigate the atomic-scale structures of materials. Fundamentals of diffraction and several state-of-the-art diffraction techniques (such as Single Crystal Diffractometer, X-ray Powder Diffractometer and Synchrotron X-ray Techniques) are introduced.

III. Microstructure: the internal microstructure of materials affects its properties. It can be a simple grain structure or more complex multiphase components. How the microstructures form and how properties of materials can be controlled are covered in this topic.

IV. Mechanical Behavior of Solids: the mechanical properties of structural material are dependent on its interatomic interactions, crystal structure, microstructure (and also some other factors). Here, the concept of stress and strain is introduced to show how stress and strain control the mechanical behaviors.

V. Materials Under Extreme Conditions: the extreme conditions here are mainly related to pressure and temperature. For instance, the T/P conditions of Earth's crust, mantle and core. Different phases of matter and relevant phase transitions (and maybe the mechanisms) are shown under extreme conditions.

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Generally, this course is taught in Chinese. However, it will be taught in English to some extent if there are international students taking this course.

課程進度：

堂次	時數(小時)	進度說明
1	3hrs	Atomic Structures of Materials: such as diamond (C), salt (NaCl), and so on. Close-packed systems of atoms are mentioned as well.
2	3hrs	Diffraction: Ewald Sphere, reciprocal space, diffractometers.
3	3hrs	Microstructure: Equilibrium and Non-Equilibrium Solidifications.
4	3hrs	Mechanical Behavior of Solids: Elastic and plastic deformation, strengthening mechanisms.
5	3hrs	Materials Under Extreme Conditions: Pressure vs. Temperature Phase Diagrams.

課程學習目標：

Students are expected

1. to acquire knowledge in the relations between structures of materials and their properties.
2. to understand how materials behave under different external conditions.
3. to think independent and to ask questions in class.

理 學 院

107 學年度第一學期模組化課程

課程的重要性、跨域性與時代性：

This course covers a modern, fast-growing and interdisciplinary area with very flexible boundaries.

其他備註：