Enquiry for Course Details

CHEM3143 Introduction to materials chemistry (6 credits)		Academic Year	2023
Offering Department	Chemistry	Quota	60
Course Co-ordinator	Dr Y F Wang, Chemistry < wanglab@hku.hk >		
Teachers Involved	(Dr Y F Wang,Chemistry)		
Course Objectives	This course provides an introduction to materials chemistry. The goal is to present the fundamental knowledge of various types of materials including their structure, synthesis, and properties. This course is essential for students who wish to take advanced materials course.		
Course Contents & Topics	Classification of materials; structure of crystalline solids; phases and phase transformation; defects and mechanical properties; alloys and ceramics; introduction to soft matter; structure, synthesis, and properties of polymers; colloids; liquid crystals; viscoelasticity; applications of materials; characterization techniques.		
Course Learning Outcomes	On successful completion of this course, students should be able to:		

CLO 1	describe different materials classification and their composition, structures, and properties, and to apprehend the concept of structure/property relationship
CLO 2	explain different structures and phases, phase transformation in solid materials
CLO 3	understand defects in crystalline solid materials and relate them with mechanical properties
CLO 4	appreciate soft materials and some examples and characteristics
CLO 5	understand the concept of molecular weight distribution in polymers, and explain the effect of polymerization kinetics to their properties
CLO 6	identify examples of some important materials, and explain their structure-property relationship
CLO 7	demonstrate knowledge in materials characterizations

Pre-requisites (and Co-requisites and Impermissible combinations)	Pass in CHEM2441; and Pass in CHEM2541 or CHEM2341		
Course Status with Related Major/Minor /Professional Core	2023 Major in Chemistry (Intensive) (Core/Compulsory) 2023 Minor in Chemistry (Disciplinary Elective) 2022 Major in Chemistry (Intensive) (Core/Compulsory) 2022 Minor in Chemistry (Disciplinary Elective) 2021 Major in Chemistry (Intensive) (Core/Compulsory) 2021 Minor in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Intensive) (Core/Compulsory) 2020 Minor in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Intensive) (Core/Compulsory) 2019 Minor in Chemistry (Disciplinary Elective)		
Course to PLO Mapping	2023 Major in Chemistry (Intensive) < PLO 1,2,3 > 2022 Major in Chemistry (Intensive) < PLO 1,2,3 > 2021 Major in Chemistry (Intensive) < PLO 1,2,3 > 2020 Major in Chemistry (Intensive) < PLO 1,2,3 > 2019 Major in Chemistry (Intensive) < PLO 1,2,3 >		
Offer in 2023 - 2024	Y 1st sem	Examination	Dec
Offer in 2024 - 2025	Y		
Course Grade	A+ to F		

Grade Descriptors

A	Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate strong ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.
B	Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show evidence to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.
C	Demonstrate general but incomplete command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show some but insufficient understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show some knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data/experimental results to draw appropriate conclusions related to materials synthesis/characterization.
D	Demonstrate partial but limited command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show limited knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence but limited ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data/experimental results to draw appropriate conclusions related to materials synthesis/characterization.
Fail	Demonstrate little or no evidence of command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show little or no understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show little or no knowledge in synthesis, characterization and applications of common polymers. Demonstrate limited or no evidence of ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show little or no ability to analyze novel problems and use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities	Details	No. of Hours
Lectures		36
Tutorials		12
Reading / Self study		100

Assessment Methods and Weighting

Methods	Details	Weighting in final course grade (%)	Assessment Methods to CLO Mapping
Examination		50	CLO 1,2,3,4,5,6,7
Test	(mid-term tests and assignments)	50	CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials

W. D. Callister: Materials Science and Engineering: An Introduction (8th or 9th edition)
F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
G. Odian: Principles of Polymerizations (John Wiley and Sons, 2004)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)

Course Website

NIL

Additional Course Information

NIL