课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**Crystal Chemistry/晶体化学 MSE5017**
2.	**课程性质** **Compulsory/Elective**	专业选修课 (Specialty Elective Course)
3.	**课程学分/学时** **Course Credit/Hours**	3 学分/48 学时
4.	**授课语言** **Teaching Language**	English
5.	**授课教师** **Instructor(s)**	汪宏
6.	**是否面向本科生开放** **Open to undergraduates or not**	否
7.	**先修要求** **Pre-requisites**	无

8. 教学目标
Course Objectives

本课程主要讲述晶体、准晶体、非晶体的结构和对称性，以及金属、陶瓷、玻璃、聚合物等重要材料的晶体结构、原子模型和相关的晶体化学原理，使学生了解和掌握晶体物理和化学性质与晶体结构、微结构之间的联系，并理解有关原理和知识在材料设计制备和工程实践中的重要性。

COURSE OBJECTIVES:
1) To identify important raw materials and minerals as well as their names and chemical formulas.
2) To describe the crystal structure of important materials and be able to build their atomic models.
3) To learn the systematics of crystal and glass chemistry.
4) To understand how physical and chemical properties are related to crystal structure and microstructure.
5) To appreciate the engineering significance of these ideas and how they related to industrial products: past, present and future.

9. 教学方法
Teaching Methods

本课程将以基础知识讲授为主，结合前沿进展讲座，并穿插课程设计和实践的教学方法。教学方法不拘泥于课本和课件，综合基础知识、课程设计、前沿讲座，增加个性化交流机会，使学生理解和掌握晶体化学原理的基础知识和实际应用。

This course will be focused on lecture fundamentals, combining the frontiers in crystal chemistry, and experimental skills. This course will not be based on teaching books, instead it will consist of lectures about basic knowledge, recent advances, and experimental skills. The lecturer will have personalized communications with students, to make sure that all the students have learned and grasped the fundamental concepts and application methods.

10. 教学内容
Course Contents

Section 1	Introduction/ Chemical Elements, Minerals and Ceramic Raw Materials
Section 2	Crystal Basic, Close Packing
Section 3	Chemical Bonding and Electronegativity
Section 4	Crystal Structure Symmetry: Crystal Systems and Bravais Lattices

	Section 5	Crystal Structure Symmetry: Point Group
	Section 6	Crystal Structure Symmetry: Space Group
	Section 7	Crystal Chemistry Basic
	Section 8	X-Ray and Diffraction
	Section 9	Sizes of Atoms and Ions – Shannon-Prewitt Radii
	Section 10	Pauling's Rules
	Section 11	Typical Crystal Structures
	Section 12	Crystal Field Theory
	Section 13	Solid Solution
	Section 14	Phase Diagram and Phase Transformation
	Section 15	Defects in Crystals
	Section 16	Glass and Quasi-crystal
	Section 17	Newmann's Law and Tensor Properties
	Section 18	Structure-Properties Relationship

11. 课程考核
Course Assessment

考勤（10%）+ 作业（25%）+课程设计（25%）+期末考试（40%）
Attendance: 10% + Assignments: 25% + Project: 25% + Final: 40%

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

1. S. Trolier-McKinstry, R. E. Newnham, Materials Engineering, Cambridge University Press, 2017, ISBN 978-1-107-10378-8
2. R. E. Newnham, Properties of Materials: Anisotropy, Symmetry, Structure. Oxford University Press, 2005, ISBN 0-19-852075-1
3. Edward R.T. Tiekink and Jagadese J. Vittal, Frontiers in Crystal Engineering. John Wiley & Sons, Ltd. 2006, ISBN: 0-470-02258-2
4. 钱逸泰，结晶化学导论，中国科学技术大学出版社，2002，ISBN7-312-01088-1
5. R. C. Evans, An Introduction to Crystal Chemistry, Cambridge University Press, 1964