Course Syllabus

VK365 Materials Laboratory II

Summer 2021

Course Description:

This course provides laboratory experiences to enhance the understandings of the principles of engineering materials, including the analysis of microstructures and crystalline structures, the investigation of thermal, mechanical, and electrochemical properties. It also provides a broad perspective in identifying and understanding the role of engineering in solving critical issues facing today's society, such as plastic pollution and energy, and it provides hands-on experiences to design and execute experiments in addressing these critical issues facing humanity. The key feature of this course is the use of the combination of experiments, simulations, and theory to study on a specific topic in projects.

Instructor:

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Office: Room 527, Longbin BLDG
Office hour: 2:30 – 3:30 pm on Tuesday or by appointment

Reference Book (Author, Book Title, Publisher, Publication Year, ISBN):

Yang Leng, "Materials characterization: introduction to microscopic and spectroscopic methods", 2nd Edition, Wiley-VCH, Weinheim, Germany, 2013, ISBN: 978-527-33463-6

Lecture:

Students are expected to attend every lecture.

Time:

12:10-13:50 on Mondays and Wednesdays.

Classroom：

E2-405

Laboratory:

Location – TBA, in the School of Materials Science and Engineering.

Homework, lab notebooks, reports and infographics:

Homework is designed to provide you with necessary background information and technical know-how for the experiments you will perform. The lab notebooks are central part of the course, and you use them to document your planning, execution and reflection on the experiments. Reports and infographics are the outcome of your investigation on the topic.

Grading Policy (Assignments %, Exams, etc.):

Homework (20%)
Lab notebook (40%)
Written reports and infographics (20%)
Final oral exam (20%)

Honor Code Policy:

We follow the guidelines set out by the JI honor code:

https://www.ji.sjtu.edu.cn/academics/academic-integrity/honor-code/

Some more specific requirements:

You may discuss with your peers about the problems in the homework, lab notebooks, written reports and infographics, but you must complete these assignments on your own. For the lab notebooks, we courage you to use multimedia data file format, which include photos and videos to document your experiment.

Tentative schedule:

Week	NO.	Date	Lectures	Notes
1	1	May 10	Introduction and overview; safety rules	
	2	May 12	Review of instrumental analysis techniques	
2	3	May 17	Introduction to COMSOL	
	4	May 19	Basics of electrochemistry	
3	5	May 24	Basics of battery	
	6	May 26	Lab discussion of batteries	
4	7	May 31	Basics to life cycle analysis of batteries and basics of a whitepaper	
	8	June 2	Lab discussion of SEM and X-ray tomography of battery electrodes	
5	9	June 7	Basics of crystallography and X-ray diffraction	
	10	June 9	Basics of density functional theory	
6		June 14		Holiday
	11	June 16	Lab discussion on salt crystal analysis I	
7	12	June 21	More on crystallography	
	13	June 23	Lab discussion on salt crystal analysis II	
8	14	June 28	Basics of polymeric materials and their thermal properties	
	15	June 30	Life cycle analysis of common polymers	
9	16	July 5	Lab discussion on thermal analysis of common polymers and the basics of infographics	
	17	July 7	Introduction to Python for data analysis	
10	18	July 12	Lab discussion on the life cycle analysis of polymers and review of the course	
		July 14		
11	19	July 19	Final oral exam (to be determined)	
		July 21		
12		July 26		

		July 28		
13		August 2		
		August 4		
14				
Lab Sessions			Electrochemical battery (Battery building, SEM and X-ray tomography, COMSOL simulation)	12 hr
			Polymer recycling (DSC, FTIR, COMSOL)	12 hr
			Analysis of common salts (XRD, XRF, possible SEM-EDS, Mercury, Quantum espresso)	12 hr

Note:

The schedule is subject to change.