MEMS 1059: Phase Equilibria in Multicomponent Materials
Fall 2021

Credits and contact hours (lecture/lab): 3 Credits, 3 Contact Hours (2 lecture, 1 recitation)

Designated as 'Required' or 'Elective' Course: Required

Course Description

Thermodynamics of solutions with applications to materials systems; heterogeneous phase equilibria; relations between free energy and phase diagrams; electrochemistry; rate processes; thermodynamics of surfaces.

Mode of Delivery	On Campus
Workload	3 hours of lectures/tutorials and 8 hours of private study per week.
Prerequisites and Co-Requisite	ENGR 0022 or MET 1162) and (ME 0051 or MEMS 0051 or MET 1110
Couse Schedule	Monday 8:15-11:00am Zone 3 Room 104
Instructor, Email	Grace Chen, grace.chen@scu.edu.cn
Instructor's Office Location	Zone 3 – Rm. 319B
Teaching Assistant, Email	Lucy Sheng, 2018141522005@stu.scu.edu.cn

Textbook: D. R. Gaskell and D. Laughlin, Introduction to the Thermodynamics of Materials, 6th ed., Taylor & Francis, 2017.

Reference Textbooks: G.H. Meier, "Thermodynamics of Surfaces and Interfaces: Concepts in Inorganic Materials," Cambridge University Press, 2014.

N. Birks and G.H. Meier, "Introduction to the High Temperature Oxidation of Metals," Cambridge University Press, 2009.

Course Objectives: The course is designed to give juniors in MSE and Engineering Sciences an understanding of classical thermodynamics and its application to materials problems.

Course learning outcomes/expected performance criteria:

1. Thermodynamics of Solutions (70%)
2. Binary Phase Diagrams (70%)

3. Free Energy Diagrams (70%)
4. Chemical Reaction Equilibria (70%)
5. Thermodynamics of Electrochemical cells (70%)
6. Thermodynamics of Surfaces and Interfaces (70%)

Course topics and time devoted to each topic:
Review of Basic Thermodynamics (2 weeks)
Phase Equilibria and Free Energy Diagrams (3 weeks)
Thermodynamics of Solutions (3 weeks)
Thermodynamics of surfaces (2 week)
Thermodynamics of Chemical Reactions (1 week)
Reactions Involving Solutions (1 week)
Electrochemistry (2 week)

Contribution of course to meeting the requirements of criterion 5:	Engineering Science:	3 Credits
	Engineering Design:	0 Credits
	College Level Mathematics:	0 Credits
	Basic Science:	0 Credits
	Realistic Constraints:	0 Credits

Grading Policy

Assessment Task	**Value**
1. Attendance and Answer Questions in Class	10 %
2. Homework	30 %
3. Mid-Semester Examination	30 %
4. Final Examination	30 %

The Instructor reserves the right to moderate the assessment policy. This process will occur at the end of the semester.

Prepared by: Grace Chen Date: 18 July 2021