



# Course Outline

MATS2006

Diffusion and Kinetics

Materials Science and Engineering

Science

T3, 2022



## 2.2 Course aims

In this course you will be introduced to the fundamentals of kinetics and diffusion mechanisms pertinent to engineering materials. When successfully completed, you will be able to apply these fundamentals to quantify transport phenomena that occur in various materials processing applications.

## 2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Correctly use the language of chemical kinetics including: rate, rate law, order, molecularity, elementary and overall reaction, half-life; isolation method, pseudo-order, rate determining step, reactive intermediate, steady state approximation; mechanism; activation energy, frequency factor; catalyst; potential energy surface, reaction coordinate, steric factor, transition state
2. Understand the role of microstructural features such as grain boundaries, dislocations and point defects in diffusion and kinetics
3. Derive fundamental kinetics and diffusion laws and use these to model material processes and behaviours
4. Interpret and quantify time dependent chemical kinetics and mass transfer processes which occur in materials, materials processing and synthesis operations

## 2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcome (PLO)	Related Tasks & Assessment
	Correctly...	1.2 & 1.3	1, 2, 3 & 4







and Diversity Unit: <https://student.unsw.edu.au/disability>. Early notification is essential to enable any necessary adjustments to be made.

- Rules governing conduct during exams are given at: <https://student.unsw.edu.au/exam-rules>

#### **4.4. Feedback on assessment**

Lab reports: Students will receive their mark and individualised feedback on the areas they excelled at and which areas of the repo

- Levenspiel, Chemical Reaction Engineering, John Wiley & Sons, any edition, freely available in electronic version.
- H. Y. Sohn, Fundamentals of the Kinetics of Heterogeneous Reaction Systems in Extractive Metallurgy, Rate Processes of Extractive Metallurgy (Eds. H Y Sohn and M E Wadsworth), Plenum Press, 1979.
- H S Ray, Kinetics of Metallurgical Reactions, International Science Publisher, 1993.
- N.J. Themelis, Transport and Chemical Rate Phenomena, Gordon and Breach, 1995.
- DA. Porter and K.E. Easterling, Phase Transformations in Metals and Alloys, Chapman & Hall, London, 1991.
- P.Shewmon, Diffusion in Solids, 2nd Edition, Minerals, Metals & Materials Society, Warrendale, PA, 1989.
- Robert Reed-Hill, Physical Metallurgy Principles, PWS-Kent Pub. 1992