

# MSE 415 - Transport Phenomena and Kinetics in Materials Processing

**2012-2013 catalog description:** Principles of heat transfer, diffusion, mass transfer and kinetics, as applied to materials processing. [4 units offered in the Fall]

**Prerequisites:** MSE 222 or MSE 331R; MSE 345; MATH 254

**Textbooks:** 1. **Transport Phenomena in Materials Processing**, *D.R. Poirier and G.H. Geiger*: TMS, Warrendale, PA, 1994.  
2. **Notes on Kinetics**, *D.R. Poirier* (will be distributed).

## Topics:

1. Thermal conductivity of materials.
2. Heat transfer and the energy equation.
3. Heat transfer coefficients.
4. Conduction heat transfer.
5. Fick's law and diffusivities of materials.
6. Diffusion in solids.
7. Mass transfer.
8. Kinetics of reactions in fluids.
9. Nucleation in condensed phases.
10. Nucleation and growth in solids.
11. Grain growth.
12. Mixed kinetics of gas-solid reactions.

**HOMEWORK:** Doing homework and self-study are very important to your success in this class. Homework is assigned, and some of it will be discussed during class. It is not collected and graded, but it should be done because this is a problem-solving course. By doing homework in a timely manner you will better understand the course material, and you will be preparing for the tests. Copies of the solutions to assigned problems are posted for you.

**TESTS AND GRADING:** Your grade will be based entirely on test performance (three midterm tests and final exam). Any reference material may be used during the tests and the final exam (i.e., "open books-open notes"). To do well will require understanding, practice (i.e., do the homework), maybe some organizing, but not memorization.

	Points	Percent	Grade
Two tests, 100 points per test	200	80	A
Lowest test grade, 50 points	50	65	B
FINAL EXAMINATION	<u>150</u>	50	C
	400	38	D
		<38	E

Note that the lowest of the three midterm-test is weighted 50%.