

MSE 250: Introduction to Materials Kinetics and Transport Phenomena

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Term: Spring 2015
Credit Hours: 3
Prerequisites: Engineering Fundamentals 230, Mathematics 142 or 148
Co-requisites: MSE 201 (Introduction to MSE), Mathematics 231 (Differential Equations I)
Time: TR, 8:10-9:25am
Place: Perkins Hall 216
Office Hour: Tue and Thu after class, or preferably by appointment (email or phone)

Catalog Description

Mass and energy balances and reaction kinetics. Steady state and transient heat transfer. Viscous flow of gases and liquids. Applications to synthesis and processing of engineering materials and technologies. Analytical and numerical problem solving.

Additional Description

- This course is intended for sophomores to learn fundamentals of transport phenomena and materials kinetics, and to apply them to a range of examples that illustrate key ideas of materials processing. We will cover four parts: momentum transport, energy transport, mass transport, and reaction kinetics. It lays mathematical foundations for your future study.
- It provides background knowledge for MSE 320 (Diffusion and Phase Transformations) and MSE 370 (Materials Processing).
- In MSE undergraduate curriculum, this course is required to cover a certain extent of numerical methods and practices. This also serves for the purpose of ABET accreditation (Accreditation Board for Engineering and Technology, Inc.).

Numerical Lab

- Matlab basics, including quadrature, simple differential equations, and post-processing.
- Demonstrate numerical algorithms in solving differential equations. Provide sample matlab codes.
- Demonstrate commercial software for transport phenomena.

Textbook

- Transport Phenomena and Materials Processing, by Sindo Kou, John Wiley & Sons Inc., 1996. (This required textbook only covers momentum, energy and mass transport.)
- Fundamentals of Chemical Reaction Engineering, by M.E. Davis & R.J. Davis, McGraw Hill, 2003. (This book is for your reference only – *no need to purchase it*. Some pages from this book will be copied and provided.)

Evaluation

Homework: 30% (Homework turned in late will be penalized by 10% per calendar day)
Midterm: 30% or 40%
Final Exam: 30% or 40%

----- Prepared on January 1, 2015 ----