Fate and Transport Processes in Environmental Engineering

Course Objectives: At the completion of this course, the student will be able to: 1) determine the equilibrium partitioning of chemical species in multiphase systems; 2) derive differential equations that describe the transport of fluids and chemical species in chemical reactors and in the environment; and 3) solve differential equations and apply the solutions of dimensionless equations to quantitatively assess the fate and transport of chemical species in multiphase systems.

Course Prerequisites: vector calculus and ordinary differential equations

Topics:
Weeks 1-2: Fugacity and Equilibrium Partitioning
Weeks 3-4: Steady State Diffusive Transport
Weeks 5-6: Time Dependent Diffusive Transport
Weeks 7-8: Diffusive Transport with Reaction
Weeks 9-10: Convective and Dispersive Transport
Weeks 11-12: Boundary Layer Mass Transfer
Weeks 13-14: Interphase Mass Transfer
Week 15: Numerical Methods for Solving Partial Differential Equations

Examinations: There will be 3 in-class midterm exams and one comprehensive final exam.

Grading: A (85-100%); B (75-85%); C (65-75%); D (50-65%); E (<50%)

Exam 1 (20%): Tuesday, February 13
Exam 2 (20%): Tuesday, March 20
Exam 3 (20%): Tuesday, April 17
Final (25%): Monday May 7, 3:30-5:30 PM
Homework (15%)

Instructor: James Farrell 306-F Civil Engineering Building
Office hours: 12:00 – 1:00 PM Tuesday/Thursday or by appointment.
e-mail: farrellj@email.arizona.edu
phone: (520) 621-2465

Text: A. Eduardo Saez and James C. Baygents, *Environmental Transport Phenomena,* CRC Press, 2014. ISBN 978-1-4665-7623-0

Additional Policies, Warranties and Disclaimers:

1. Required attendance policy: Attendance at lectures is not mandatory. For examinations: All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

2. Late homework will not be accepted without prior approval of the instructor.

3. Policies regarding expected classroom behavior: no use of cell phones or mobile devices during class.

4. Policies against plagiarism follow the Student Code of Academic Integrity: http://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity.

5. Policies against threatening behavior by students: http://policy.web.arizona.edu/threatening-behavior-students.

6. Policies against discrimination and harassment: http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy.

7. Required extracurricular activities: none

8. Special materials required for the class: none

9. Accommodations for students with disabilities: It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations.

10. Information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

11. Final Exam Regulations: http://www.registrar.arizona.edu/schedule101/exams/examrules.htm

12. Final Exam Schedule: http://www.registrar.arizona.edu/schedules/finals.htm.