The University of Jordan

School of Engineering

Chemical Engineering Department

1. **SEMESTER:** First semester 2025 - 2026

2. **COURSE INFORMATION**
   - Code and Name: **0905742 - Mass Transfer** – MSc course
   - Perquisites: Transport Phenomena
   - Credit Hours: 3
   - Class Meeting: Mon/Wed 4:30-6:00

3. **INSTRUCTOR**
   - **Dr. Hatem Alsyouri**
   - **Office location**: CHE Department
   - **Email address**: alsyouri@ju.edu.jo
   - **Office hours**: Sun/Tue/Thu 9:30 – 10:30, Mon/Wed 2:00-3:00

4. **COURSE DESCRIPTION**

   This course includes an introduction, ordinary diffusion with applications, conservation equations with application, different kinds of diffusion, concentration distributions with more than one independent variables, different methods used to solve it, convective mass transfer models with applications, mass transfer with chemical reactions, simultaneous heat and mass transfer, multicomponent diffusion, diffusion and flow in porous media, interphase mass transfer, mass transfer with high mass transfer rates, mass transfer in turbulent flow.

5. **TEXTBOOK**

   Welty, J. R., Wicks, C. E., Wilson, R. E., and Rorrer, G. L. Fundamentals of Momentum, Heat, and Mass Transfer, 5th ed., Wiley, 2007.

   Additional References

   1. Bird, R. B., Stewart, W. E., and Lightfoot, E. N. Transport Phenomena, 2nd ed., Wiley, 2002.
   2. Cussler, E. L. Diffusion: Mass Transfer in Fluid Systems, 4th ed., Cambridge University Press, 2021.
   3. Geankoplis, C. J. Transport Processes and Separation Process Principles, 4th ed., Prentice Hall, 2003.
   4. Bennett, C. O., and Myers, J. E. Momentum, Heat, and Mass Transfer, 2nd ed., McGraw-Hill, 1974.
   5. Brodkey, R. S., and Hershey, H. C. Transport Phenomena: A Unified Approach, McGraw-Hill, 1988.
   6. Beek, W. J., Muttzall, K. M. K., and van Heuven, J. W. Transport Phenomena, 2nd ed., Wiley, 2000.
   7. Sissom, L. E., and Pitts, D. R. Elements of Transport Phenomena, McGraw-Hill, 1972.
   8. Slattery, J. C. Momentum, Energy, and Mass Transfer in Continua, McGraw-Hill, 1972.
   9. Greenkorn, R. A., and Kessler, D. P. Transfer Operations, McGraw-Hill, 1969.
   10. McCabe, W. L., Smith, J. C., and Harriott, P. Unit Operations of Chemical Engineering, 7th ed., McGraw-Hill, 2005.
   11. Mulder, M. Basic Principles of Membrane Technology, 2nd ed., Springer, 1996.
   12. Fogler, H. S. Elements of Chemical Reaction Engineering, 6th ed., Pearson Education, 2020.
   13. Research notes

6. **WEBSITE**
   - **E -learning account** (https://elearning.ju.edu.jo/)
   - https://eacademic.ju.edu.jo/Alsyouri/default.aspx

7. COURSE LEARNING OUTCOMES (LOs)

Upon successful completion of the course, the student should be able to:

1. Explain the fundamental principles of molecular diffusion and mass conservation.
2. Derive and solve governing equations for steady and unsteady mass transfer.
3. Apply Fick's laws and continuity equations to engineering systems.
4. Analyze convective mass transfer using film, penetration, and boundary-layer models.
5. Evaluate mass transfer with chemical reactions and coupled heat–mass transfer effects.
6. Examine multicomponent diffusion and diffusion in porous or membrane media.
7. Assess interphase mass transfer and determine overall mass transfer coefficients.
8. Apply mass transfer principles to design and analysis of engineering processes.
9. Interpret experimental or computational results using dimensionless parameters and correlations.
10. Communicate technical analyses effectively in written and oral forms.

8. Course Topics

Topic	# of Weeks
CHAPTER 24: Fundamentals of Mass Transfer (LOs: 1-3)	
CHAPTER 25: Differential Equations of Mass Transfer (LOs 2, 3, 6)	
CHAPTER 26: Steady-State Molecular Diffusion (LOs: 1-3, 5, 6)	
CHAPTER 27: Unsteady-State Molecular Diffusion (LOs 2, 3, 6)	
CHAPTER 28: Convective Mass Transfer (LOs 4, 5, 7, 9)	
CHAPTER 29: Convective Mass Transfer Between Phases (LOs 4, 7, 8)	
CHAPTER 30: Convective Mass-Transfer Correlations (LOs: 8, 9)	
CHAPTER 31: Mass-Transfer Equipment (LOs: 6, 8)	

9. POLICIES AND EXPECTATIONS

- **Attendance:** Students must attend all classes and are responsible for any material or announcements made. The university attendance policy will be strictly followed.
- **Instructional methods:** Lectures, class discussions, and in-class problem solving
- **Software:** Use of EXCEL, MATLAB, or POLYMATH is encouraged for calculations, data analysis, and graphical presentation.
- **Quizzes and homework**: Homework must be submitted on time; late work is not accepted. Pop quizzes may be given without prior notice. A calculator is required for all sessions. One midterm and one comprehensive final exam will be administered. These exams will be comprehensive and designed to challenge students' understanding and problem-solving skills.
- **Classroom conduct in:** Phones and laptops must be turned off unless used for instructional purposes. Professional and respectful behavior is expected at all times.
- **Academic Integrity:** All forms of academic dishonesty will be handled according to university regulations.

10. ASSESSMENT & GRADING

Assessment	*Weight*
Assignments (x2)	30%
Midterm	30%
Final exam	40%
Total	**100%**

Note: The instructor has the right to amend the content of this syllabus and keep students informed about the updates.

Date 05-10-2025