Jordan University of Science and Technology

Faculty of Engineering

Chemical Engineering Department

CHE771 Adv. Transport Phenomena - JNQF Level: 9
First Semester 2022-2023

Course Catalog
3 Credit Hours. Transport properties. Unified treatment of the transport of momentum, heat, and mass. This course includes lab/ simulation component.
Teaching Method: On Campus

Text Book	
Title	Transport Phenomena
Author(s)	R. Bird, W. Stewart, E. Lightfoot
Edition	2nd Edition
Short Name	Textbook
Other Information	Wiley, New York, 2002

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #1	Transport Phenomena ? A Unified Approach	R. Brodey and H. Hershey	9th Edition	McGraw? Hill, New York, 1988
Ref #2	Fundamentals of Momentum, Heat and Mass Transfer	J. Welty, G. Rorrer, and D. Foster	6th Edition	Wiley, New York, 2015
Ref #3	Transport Phenomena Fundamentals	J. Plawsky	3rd Edition	CRC Press, New York, 2014

Instructor	
Name	**Prof. Rami Jumah**
Office Location	CH1 L2

Office Hours	Sun : 10:00 - 11:30 Mon : 11:30 - 12:30 Tue : 10:00 - 11:30 Wed : 11:30 - 12:30 Thu : 12:30 - 13:30
Email	ramij@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Mon, Wed : 10:00 - 11:30 Room: U

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	The Subject of Transport Phenomena	From **Textbook**
Week 2	Viscosity and the mechanisms of momentum transport	From **Textbook**
Week 3	Shell momentum balances and velocity distributions in laminar flow	From **Textbook**
Weeks 4, 5	The equations of change for isothermal systems	From **Textbook**
Week 6	Thermal conductivity and the mechanisms of energy transport	From **Textbook**
Week 7	Shell energy balances and temperature distributions in solids and laminar flow	From **Textbook**
Weeks 8, 9	The equations of change for nonisothermal systems	From **Textbook**
Week 10	Diffusivity and the mechanisms of mass transport	From **Textbook**
Week 11	Shell mass balances and concentration distributions in solids and in laminar flow	From **Textbook**
Weeks 13, 14	The equations of change for binary mixtures	From **Textbook**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Explain the fundamental mechanisms of momentum, energy, and mass transport, demonstrating a deep understanding of their interrelated principles and applications in chemical engineering. [1L9K1]	20%	
Apply the shell balance approach to systematically derive differential equations for momentum, heat, and mass balances in various coordinate systems, including Cartesian, cylindrical, and spherical. [1L9K2]	20%	
Utilize the generalized equations of change to approach and solve complex transport problems, selecting appropriate assumptions and tools to create effective solutions. [1L9S1]	20%	

Integrate the principles of momentum, heat, and mass transfer, applying them cohesively to analyze complex chemical engineering processes and solve transport-related problems. [1L9S2]	10%	
Analyze transport problems in various geometries, deriving analytical solutions to predict velocity, temperature, and concentration distributions. [1L9S3]	10%	
Evaluate the accuracy of analytical and numerical results for transport phenomena, reflecting on the limitations of models and continuously seeking improvements in problem-solving approaches. [1L9C2]	10%	
Design and implement structured problem-solving methods to handle complex, multi-dimensional transport phenomena, demonstrating initiative and a strong grasp of technical complexities. [1L9C6]	10%	

Relationship to Program Student Outcomes (Out of 100%)						
1	2	3	4	5	6	7

Relationship to NQF Outcomes (Out of 100%)						
L9K1	L9K2	L9S1	L9S2	L9C2	L9S3	L9C6
20	20	20	10	10	10	10

Evaluation	
Assessment Tool	**Weight**
First Exam	15%
Second Exam	15%
Assignments	10%
Project	10%
Final Exam	50%

Policy	
Attendance	Attendance will be checked at the beginning of class. University regulations will be followed for students exceeding the maximum number of absences.
Student Conduct	It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Cheating will not be tolerated in this course. University regulations will be pursued and enforced on any cheating student.

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