Jordan University of Science and Technology
Faculty of Engineering
Biomedical Engineering Department

BME 441: Biomedical Transport Phenomenon

Course Catalog
3 Credit hours (3 h lectures). Principles of momentum, heat, and mass transfer with applications to medical and biological systems and medical device design**.**

Text Book(s)	
Title	Transport Phenomena in Biological Systems
Author(s)	George Truskey, Fan Yuan, and David Katz
Publisher	Pearson
Year	2010
Edition	2nd edition.

References	
Books	• Class Notes • Biotransport: Principles and Applications
Software	Matlab and Mathematica

Instructor	
Instructor	Dr. Hossam Elkhalil
Office Location	College of Engineering building, CH1-L2
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Prerequisites	
Prerequisites by topic	Bio-fluid, Thermodynamics, Physiology and Anatomy
Prerequisites by course	BME 342(+pass), BME 344 and MED 236A
Co-requisites by course	-
Prerequisite for	

Objectives and Outcomes	
Objectives	**Outcomes**
Understand the role of diffusion and convection in Biotransport [1,6,3,7,8]	Understand the basic properties of solute transport in Biological Systems Gain knowledge of active and passive membrane transport and their energetics in

Objectives and Outcomes	
Objectives	**Outcomes**
	cellular system.
Understand Biotransport Fundamentals of the cardiovascular, pulmonary, and renal applications. [1,6,3,7,8]	Understand the O2 transport in Biological Systems Gain knowledge about the drug absorption and modeling approaches
Introducing concepts linking transport to function in biological systems. [1,6,3,7,8]	Understand the function of various extracorporeal devices: Blood oxygenaters, Hemodialysis, and Immobilized Enzyme reactors.
Learn the Mathematical techniques for solving transport problems [1,6,3,7,8]	Gain knowledge for solving and modeling different devices using Mathematica and/or Matlab
Encourage Long Life Learning, foster team work and enhance students communication skills [1,6,3,7,8]	Write technical report and give oral presentation on team work project

Tentative Course Content

Topic	Readings
• Introduction	• Chapter 1
• Conservation Relations and Fluid Mechanics	• Chapter 2, 3, 4
• Diffusive Mass Transport and Relation to Convection	• Chapter 2,6,7
• Trans-vascular Transport & Blood Oxygenator	• Chapter 9,13
• Heat Transfer	• Chapter 17
• Numerical and Computational Methods	• Handout
• Fluid Dynamics and Momentum Balance	• Chapter 2,3,4
• Applications and Models	

Evaluation		
Assessment Tool	**Expected Due Date**	**Weight**
Homework, Performance,&/or Quizzes	Announced when assigned	15 %
Project	TBD	5 %
First Exam	TBD	20 %
Second Exam	TBD	20 %
Final Exam	According to the University final examination schedule	40 %

Policy	
Attendance	Class attendance is required and applied according to the university regulations (**student's guide page 43**). Data support the idea that class attendance improves learning. It is very difficult as well as uninspiring for me to help a student who does not attend lectures. What is created in the classroom cannot be reenacted. Make-up tests will be done according to the university regulations. Please see student's guide pages 44-45.

Policy	
Homework	Working homework problems is an essential part of this course and they represent a key opportunity to learn the subjects discussed. All homework problems assigned during a given week are due at the beginning of class on the second meeting of the following week unless otherwise stated. Late homework will not be accepted. Failure to turn in this particular homework **on time** will result in a grade of 0 (zero) for the homework contribution to your final grade. Team work is encouraged; however, the work one hands in must represent his/her own effort. Homework solutions can be discussed with the teaching assistant. There will be no handouts of homework solutions.
Student Conduct	All University regulations apply to this course. In particular, the policies concerning academic dishonesty and withdrawal from a course apply.

Contribution of Course to Meeting the Professional Component

The course contributes to building the fundamental basic concepts and applications of materials science and engineering in Biomedicine and Bioengineering.

Relationship to Program Outcomes (%)

1	2	3	4	5	6	7	8	9
45		15			15	15	15	

Relationship to Biomedical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO 4
√		√	√