

BMED 3310 Biotransport (Required)

Catalog Description: BMED 3310 Biotransport (4-0-4)
Prerequisite(s): BMED 2210 (w/ minimum grade of “C”),
MATH 2551 and MATH 2552
Fundamental principles of fluid, heat, and mass transfer with
particular emphasis on physiological and biomedical systems.

Textbook: Fundamentals of Momentum, Heat, and Mass Transfer, Welty,
Wicks, Wilson and Rorrer, 5th edition, John Wiley&Sons, Inc.,
(2008)

Prepared by: Ross Ethier

Topics Covered:

1. Molecular mass transfer, differential equations of mass transfer, convective mass transfer
2. Fluid mechanics, principles of fluid flow
3. Heat transfer, differential equations of heat transfer, convective heat transfer, heat exchangers
4. Transient heat transfer

Course outcomes:

Students who complete this course will be able to:

Outcome 1: Identify, formulate, and solve biomedical problems involving mass, momentum and/or heat transfer (Student Outcomes a and e)

- 1.1 Formulate differential equations that represent the physical situation of biomedical problems involving mass, momentum and/or heat transfer (or combinations thereof) and determine appropriate boundary conditions
- 1.2 Apply conservation laws of fluid flow to describe the system (pressure drops, velocities, velocity profiles, shear stresses, shear rates) for various geometries, particularly for flow through conduits
- 1.3 Apply differential mass or heat balances to determine concentrations or temperatures at a particular point or concentration/temperature profiles with and without biochemical reactions, and to determine mass/heat fluxes, respectively

Outcome 2: Explain analogies between heat and mass transfer, and employ them to solve biomedical engineering problems (Student Outcomes a and e)

- 2.1 Distinguish between modes of heat or mass transfer, explain analogies between heat and mass transfer, and apply the correct equations to describe each mode
- 2.2 Determine convective mass/heat transfer coefficients using appropriate analogies for the geometric situation
- 2.3 Distinguish between modes of heat transfer or mass transfer, explain analogies between heat and mass transfer, and apply the correct equations to describe each mode

Correlation between course outcomes and student outcomes:

BMED 3310											
	Biomedical Engineering Student Outcomes										
Course outcomes	a	b	c	d	e	f	g	h	i	j	k
1.1	X				X						
1.2	X				X						
1.3	X				X						
2.1	X				X						
2.2	X				X						
2.3	X				X						

The Wallace H. Coulter Department of Biomedical Engineering Student Outcomes:

- a. an ability to apply knowledge of mathematics, science, and engineering;
- b. an ability to design and conduct experiments, as well as to analyze and interpret data;
- c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, societal, political, ethical, health and safety, manufacturability, and sustainability;
- d. an ability to function on multidisciplinary teams;
- e. an ability to identify, formulate, and solve engineering problems;
- f. an understanding of professional and ethical responsibility;
- g. an ability to communicate effectively;
- h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- i. a recognition of the need for, and an ability to engage in lifelong learning;
- j. a knowledge of contemporary issues;
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;