BME 4421/6421 – Biotransport

Course Description
Behavior of fluids as encountered in everyday life, general engineering and biomedical engineering applications. Properties of body fluids, solute mass transport in biological systems, fluid mechanics of blood and other fluids, oxygen mass transport.

Undergraduate/Graduate level - 3 credit hours.

*Homework and exams are specific for the graduate students. In them concepts are explored at a deeper level than for undergraduates.

Course Learning Objectives
Course Objectives:
Students will learn:
- The relationship between blood flow and physiological function and dysfunction in the surrounding tissues and organs.
- To solve transport equations using methods from advanced mathematics.
- To apply fundamental biotransport fundamentals to the design and interpretation of experiments.
- Transendothelial transport and oxygen delivery to tissues and organs.

Course Learning Outcomes
Students who successfully complete the course can:
1. understand the relationship between blood flow and physiological function and dysfunction in the surrounding tissues and organs.
2. solve transport equations using methods from advanced mathematics.
3. apply biotransport fundamentals to the design and interpretation of experiments.
4. understand transendothelial transport and oxygen delivery to tissues and organs.

Tentative Weekly Schedule

Week 1	Hydrostatics equilibrium/differential equation
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Week 2	Other types of flow/ Laplace Transform
	Quiz- chapter 1
Week 3	The first& second law of thermodynamics 2.1-2.3
	Quiz- Applications of equilibrium thermodynamics 2.6
Week 4	Osmotic pressure 3.1-3.5
	Hydraulic conductance and action potential 3.5-3.10
Week 5	Review
	Midterm #1
Week 6	Hagen-Poiseuille 4.1-4.7
	Quiz - Casson fluid 4.8-4.10
Week 7	The Fahraeus effect 4.11-4.14
	Quiz- Boundary layer theory 4.15
Week 8	Capillary flow rates 5.1-5.3
	Quiz- Fick's first law 5.4.1
Week 9	Fick's Second law 5.4.2
	Quiz- 5.4.3-5.4.5
Week 10	Mass transfer 5.4.6
	Review
Week 11	**Midterm #2**
	Diffusion of oxygen 6.1-6.6

Week 12	Tissue oxygenation 6.7
	Quiz- Pharmacokinetic Analysis 7.3-7.4
Week 13	Class Presentation
	Class Presentation
Week 14	Class Presentation
	Review