



BiS 371

Prof. Je-Kyun Park Room 1119, E16 Building jekyun@kaist.ac.kr (Tel. 4315) Fall 2022 Room 220, E16 Building Mon and Wed 14:30-16:00 https://nanobio.kaist.ac.kr

BiS 371 Biofluidics

Synopsis

This course introduces basic concepts of biological transport phenomena in biosystems and helps the design of biosensors, microfluidic devices, and organ-on-chips for medical and biotechnological applications. This course also covers several topics of fluid mechanics, mass transport, and biochemical interactions, with engineering concepts motivated by specific biological or medical problems..

Credit

3 units (3:0:3)

Prerequisite

None. Recommended courses are BiS200 (*Bioengineering Fundamentals*), BiS223 (*Physical Principles in Biological Systems*), or equivalent.

Grading

Homework 40%, Midterm Exam 30%, and Final Exam 30%

Office Hours

Mon and Wed 16:00 - 18:00

Teaching Assistants

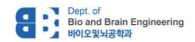
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Textbook

G. A. Truskey, F. Yuan, and D. F. Katz (2009). *Transport Phenomena in Biological Systems (2nd Edition)*, Prentice Hall, ISBN: 9780131569881

References

- 1. Ali Ostadfar (2016). *Biofluid Mechanics. Principles and Applications,* Academic Press, ELSEVIER. ISBN: 9780128024089
- 2. Fournier, R. L. (2017). *Basic Transport Phenomena in Biomedical Engineering*, 4th Edition, CRC Press, ISBN: 9781138749535



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Fall 2022

Lecture Schedule

Week	Topics	Contents	Chapter
1	I. Introduction	Course Outline / Overview & Units	1
2	II. Fundamentals of Biofluid Mechanics	Fluid Properties / Blood Rheology	2,3
3		Fluid Statics & Kinematics / Conservation of Mass	
4		Momentum Balances / Dimensional Analysis & Scaling	3
5	III. Microfluidics and Biofluidics	Microfluidics Theory	4
6		Micromanipulation & Separation	
7		Lab-on-a-Chip	
8	Midterm Exam. Period		
9	IV. Fundamentals of Mass Transport	Mass Transport in Biological Systems	6,7
10		Transport of Nanoparticles & Biochemical Species	
11	V. Biochemical Interactions	Biochemical Reaction Fundamental	10
12		Biochemical Reactions in Microsystems	10
13		Receptor-Ligand Binding Kinetics	11
14	VI. Transport in Organs	Drug & Organ Transport	15, 16
15		Organ-on-a-Chip	16
16	Final Exam. Period		