BiS 371
Prof. Je-Kyun Park
Room 1119, E16 Building
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Fall 2018
Room 220, E16 Building
Mon and Wed 13:00-14:15
http://nanobio.kaist.ac.kr

BiS 371 Biofluidics

Synopsis
This course introduces basic concepts of biological transport phenomena and helps the design of microfluidic devices and organ chips for biomedical and biotechnological applications. This course also covers topics in fluid mechanics, mass transport, and biochemical interactions, with engineering concepts motivated by specific biological problems. All students are required to present one application topic in biological systems at the end of semester.

Credit
3 units (3:0:3)

Recommended Prerequisite
BiS200 (*Bioengineering Fundamentals*), BiS223 (*Physical Principles in Biological Systems*), or equivalent.

Grading
Homework 40%, Exam 40%, and Oral Presentation 20%

Office Hours
Mon and Wed 15:00 - 17:00

Teaching Assistants
Hwisoo Kim (gnltn333@kaist.ac.kr, Tel: 4355, Room 802, E16); Juhwan Park (juhwan3275); Minkyung Cho (mkcho25); Yeji Kwon (syh083)

Textbook
G. A. Truskey, F. Yuan, and D. F. Katz (2009). *Transport Phenomena in Biological Systems (2nd Edition)*, Prentice Hall, ISBN: 978-0135131541

References
1. R. J. Roselli and K. R. Diller (2011). *Biotransport: Principles and Applications*, Springer, ISBN: 978-1441981189
2. R. L. Fournier (2006). *Basic Transport Phenomena in Biomedical Engineering*, 2nd Edition, CRC Press, ISBN: 978-1591690269
3. J. Berthier and P. Silberzan (2009). *Microfluidics for Biotechnology* 2nd Edition, Artech House, Inc., ISBN: 978-1596934436
4. D. Li (Ed.) (2015). *Encyclopedia of Microfluidics and Nanofluidics*, 2nd Edition, Springer, ISBN: 978-1461454885

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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
10		Transport of Nanoparticles & Biochemical Species	
11	*V. Biochemical Interactions*	Biochemical Reactions in Microsystems	10
12		Receptor-Ligand Binding Kinetics	11
13		Drug Transport	15
14		Organ Chips	16
15	*VI. Student Presentation*	Oral Presentation	
16	*Final Exam. Period*		