

**BiS 371**

Prof. Je-Kyun Park  
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**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

Jongho Park (park9499@kaist.ac.kr, Tel.4355, Room: 801, E16); Yejin Choi (yejin9343); Untaek Oh (untaek624)

### 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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## Lecture Schedule

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