

BiS 571

Prof. Je-Kyun Park
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Spring 2019

<https://nanobio.kaist.ac.kr>

BiS 571 BioElectroMechanics

Synopsis

This course provides a fundamental understanding of bioelectromechanical systems (BioMEMS) and lab-on-a-chip technologies. In particular, the lectures focus on the basic fabrication technologies for lab-on-a-chip applications and theoretical aspects of microfluidics. Several working principles of micro total analysis systems and lab-on-chips are introduced and discussed to address the fundamental aspects of analytical, biomedical, diagnostic and therapeutic devices. The lectures are supplemented by computational fluid dynamics (CFD) laboratories, which cover basic knowledge and practical application of CFD in typical microfluidic devices.

Credit

3 units (3:0:3) (This course is mutually recognizable between Bachelor or Master programs.)

Prerequisite

Senior or Graduate standing is required. Recommended prerequisite courses include BiS 377 (Biomechanics), 371 (Biofluidics), or equivalent.

Grading

Homework & Midterm Exam (30%) / Lab Reports (40%) / Term Project, Presentation, & Paper (30%)

Lecture and Lab Hours

Lecture: Mon & Wed 13:00 - 14:30 (E16 Building, Room 220)

Lab: Mon & Wed 19:00 - 22:00 (E16-1 Building, Room 311)

Office Hours

Mon & Wed 14:30 - 16:00 (E16 Building, Room 1119)

Teaching Assistants

Juhwan Park (juhwan3275@kaist.ac.kr, Tel. 4355 or 5355, Room: 801-805, E16);
Hwisoo Kim (hwiss); Minkyung Cho (mkcho25)

Textbooks

1. S.-J. J. Lee, N. Sundararajan (2010). *Microfabrication for Microfluidics*, Artech House, ISBN: 978-1-59693-471-9
2. KAIST NBL (2019). *CFD Simulation Laboratory Manual*. 6th edition.

References

1. D. Li (Ed.) (2015). *Encyclopedia of Microfluidics and Nanofluidics*, 2nd Ed., Springer, ISBN: 978-1-4614-5491-5 (on line)

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Lecture Schedule

Week	Topics	Contents
1	Introduction	Course Outline / Overview
2	Fundamentals of Micro/Nano Fabrication	Materials for Microfluidic Devices & Photolithography
3		Soft Lithography & Subtractive Processes
4		Additive Processes, 3D Printing & Fluidic Interfacing
5	Bio-fluidics Theory and Applications	μ TAS Overview & Theoretical Aspects of Microfluidics
6		Micromanipulations & Separations
7	Microfluidics for Bioanalytical Technology	Lab-on-a-chip Applications
8	Midterm Exam. Period	
9	CFD Simulation Laboratory (1 ~ 5)	Basic Training of CFD
10		Diffusion & Mixing in Microfluidics
11		Magnetophoresis
12		Electrophoresis & Electroosmosis
13		Dielectrophoresis
14	Term Project Laboratory	
15	Term Project Presentation (Part 1)	
16	Term Project Presentation (Part 2)	