

BiS 673
Prof. Je-Kyun Park
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Spring 2021
Room 220, E16 Building
Mon & Wed, 13:00-14:15
<https://nanobio.kaist.ac.kr>

BiS 673 Bioelectronic Devices

Synopsis

This course covers advanced topics in the design and industrial application of biological detection technologies for biosensor, DNA chip, protein chip, cell chip, and lab-on-a-chip. Fundamental principles in these areas have emphasized understanding the biological recognition mechanism that encompasses all the scales of life—from biomolecules to cells, tissues, and organisms. To exploit the transducer technologies for biomolecular and cellular assay systems, topics also include a state-of-the-art technology for microfluidic devices and micro total analysis systems (μ TAS), and an integrated nano/micro system. On the basis of recent topics on biomolecular manipulation, separation, and detection technologies, each student is required to select one presentation topic and lead one discussion session.

Credit

3 units (3:0:3)

Prerequisite

Graduate standing is required. Recommended prerequisite courses include BiS 571, or equivalent. (Typical class size is between 10 and 15 students.)

Grading

Midterm Exam. 25%, Final Exam. 25%, Presentation 20%, and Final Term Paper 30%

Office Hours

Mon & Wed 14:30-16:00

Teaching Assistants

Gihyun Lee (gihyunlee@kaist.ac.kr, Tel.4355 or 5355, Room: 801, E16); **Hwisoo Kim** (hwiss);
Minkyung Cho (mkcho25)

Textbook

Albert Folch (2012). *Introduction to BioMEMS*, CRC Press, ISBN: 978-1-4398-1839-8,
<http://www.crcpress.com/product/isbn/9781439818398>

References

1. I. Willner and E. Katz (eds.) (2005). *Bioelectronics: From Theory to Applications*, Wiley-VCH, ISBN: 3527306900.
2. M. Zourob, S. Elwary, A. Turner (eds.) (2008). *Principles of Bacterial Detection: Biosensors, Recognition Receptors and Microsystems*, Springer Science+Business Media, LLC, e-ISBN: 978-0-387-75113-9.

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Lecture Schedule

Week	Topics	Contents	Chapter
1	<i>Introduction</i>	Course Outline	
2	<i>Microfabrication Overview for Biodevices</i>	PDMS and Hydrogel Devices	1
3	<i>Bioelectronic Interfacing</i>	Micro- and Nanopatterning for Proteins and Cells	2
4	<i>Microfluidic Diagnostics</i>	Microfluidics Fundamentals	3
5		Microfluidic Components & Lab-on-a-Chip	3
6		Microfluidic Immunoassays	4
7		Point-of-Care Diagnostics	4
8	<i>Midterm Exam.</i>		
9	<i>Cell-based Chip & Detection</i>	Flow Cytometers & Cell Sorting	5
10		Cell Trapping & Single Cell Analysis	5
11		Cells-on-a-Chip & Patch Clamp Chip	5
12	<i>Biomicrosystems Technologies & Applications</i>	BioMEMS for Cell Biology	6
13		BioMEMS for Neuroscience	6
14		Tissue & Stem Cell Microengineering	7
15		Implantable Microdevices	8
16	<i>Final Exam.</i>		