

BiS 800

Prof. Je-Kyun Park
Room 1119, E16 Building
jekyun@kaist.ac.kr (Tel.4315)

Fall 2021

Room 207, E16 Building
Mon & Wed, 10:30-11:45
<https://nanobio.kaist.ac.kr>

BiS 800 Special Lecture in Bio and Brain Engineering <Biosensor and Lab-on-a-chip>

Synopsis

This course covers recent topics in biosensor technologies, including paper-based analytical devices, molecular diagnostics, COVID-19 detection, and miniaturized biochip technologies. From biosensing principles based on enzymes, antibodies, nucleic acids, and cells, to their applications, fundamental issues and principles in developing commercialized biosensors are focused on the first part of the lecture. The second part of the lecture includes state-of-the-art technologies for microfluidic sensors and lab on a chip, particularly in addressing the new subjects of organ-on-a-chip development.

Credit

3 units (3:0:3)

Prerequisite

Graduate standing is required. The typical class size is less than 15 students.

Grading

Homeworks 20%, Midterm Exam. 25%, Final Exam 25%, and 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)

Textbook

e-learning materials from references and journals

References

1. M. Zourob, S. Elwary, A. Turner (eds.) (2008), *Principles of Bacterial Detection: Biosensors, Recognition Receptors and Microsystems*, Springer Science+Business Media, LLC, ISBN: 978-0-387-75113-9: <https://link.springer.com/book/10.1007/978-0-387-75113-9>
2. J. Hoeng, D. Bovard, and M.C. Peitsch (eds.) (2019), *Organ-on-a-chip: Engineered Microenvironments for Safety and Efficacy Testing*, Academic Press, ELSEVIER, ISBN: 978-0-12-817202-5: <https://www.sciencedirect.com/book/9780128172025/organ-on-a-chip>

Notice

Simultaneous implementation of online and in-person classes are conducted depending on the COVID-19 circumstance during the semester.

BiS 800 Special Lecture in Bio and Brain Engineering <Biosensor and Lab-on-a-chip>

Prof. Je-Kyun Park

Fall 2021

Lecture Schedule

| Week | Topics | Contents |
|------|---|--|
| 1 | <i>Introduction</i> | Course Outlines/ Biosensor Overview |
| 2 | <i>Biosensing Principle</i> | Biorecognition/ Glucose Biosensor |
| 3 | | Immunoassays & Antibody Sensors |
| 4 | | Nucleic Acid-Based Sensors |
| 5 | <i>Transducer Integration & Multiplexed Detection</i> | Cell-based Biosensors |
| 6 | | Biosensor Array (Biochip) Technologies |
| 7 | | Point-of-Care Testing (POCT) |
| 8 | <i>Midterm Exam.</i> | |
| 9 | <i>Microfluidic Sensor & Lab on a Chip</i> | Paper-based Analytical Devices |
| 10 | | Microfluidic Assays |
| 11 | | Finger-Actuated Devices |
| 12 | | Lab-on-a-Chip |
| 13 | <i>Organ-on-a-Chip Technologies & Applications</i> | Stimulation & Sensing in Organ-on-a-Chip |
| 14 | | Case Studies: In Vitro Human Tissue Models |
| 15 | | Multiorgan-on-a-Chip Platforms to Mimic Human Physiology |
| 16 | <i>Final Exam.</i> | |