Methods of Physical Chemistry: Chemosensing

Lecturer	**Prof. dr hab. Włodzimierz Kutner**
Dates and location of classes	Summer semester 2024/2025 (27 Feb – 12 June 2025), Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland
ECTS credits	3
How to register	Send an e-mail to wkutner@ichf.edu.pl (deadline: 20 June)
Language of the course	English or Polish, depending on the attendees' preference
Brief description of the subject of teaching	Chemosensing is a part of analytical chemistry covering methods for detecting and determining chemical compounds using chemical sensors (chemosensors), as well as designing, manufacturing, and testing those sensors. These methods will be discussed and illustrated with various examples, along with chemosensor devising, fabricating, testing, and applying. The lecture course's ultimate goal is to present the recent possibilities of chemosensing to the extent that it enables independent deepening of knowledge within topics the student selects.
Form/type of teaching activity	One-semester 15-hour interactive lecture course ending with a written exam
Scope of lecture topics	- Scope of the subject taught, basic concepts, and definitions - Chemical recognition (recognition with synthetic systems) - Materials and methods in chemosensor preparation - Methods of detection signal transduction - Multisensor arrays – electronic tongue and nose - Chemosensors as detectors in flow analytical systems, including microfluidic systems - Wearable sensors
Entrance requirements	Basic knowledge at the M.Sc. level of physical chemistry (especially spectroscopy and electrochemistry), organic chemistry, and analytical chemistry
Learning outcomes	The lecture course will enable the student to learn the basic methods of detecting and determining chemical compounds in industry, food, environmental protection, etc., especially those of biological importance, using chemical sensors.
Methods and criteria of student assessment	The written exam covering topics taught will be rated at a maximum of 100 points; the student must score at least 60 points to pass the exam.
Literature	- F.-G. Banica, *Chemical Sensors, and Biosensors: Fundamentals and Applications*, Wiley, 2012 - B. R. Eggins, *Chemical Sensors and Biosensors: 2 (Analytical Techniques in the Science (AnTs))*, Wiley, 2002 - G. Orellana and M. C. Moreno-Bondi, *Frontiers in Chemical Sensors: Novel Principles and Techniques (Springer Series on Chemical Sensors and Biosensors)*, Springer, 2005 - J. L., Santos, F., Farahi, *Handbook of optical sensors*, CRC Press, Taylor & Francis Group, 2017 - S. Cosnier (Ed.), *Electrochemical Biosensors*, Pan Stanford Publishing Pte. Ltd., 2015 - R. Lalauze (Ed.), *Chemical Sensors and Biosensors*, Wiley-ISTE, 2012 - W. Kutner and P. S. Sharma (Eds.), *Molecularly Imprinted Polymers for Analytical Chemistry Applications,* in *Polymer Chemistry Series* No. 28, The Royal Society of Chemistry, 2018 - E. Sazonov, (Ed.), *Wearable sensors: fundamentals, implementation, and applications*, 2nd Ed., Academic Press, 2020 - Z. Brzózka, E. Malinowska, W. Wróblewski, *Sensory chemiczne i biosensory*, PWN, 2022. - A. A. P. Khan, R. M. Kulkarni, M. O. Ansari, A. M. A. Asiri (Eds.), *Nanomaterial-modified electrodes. Design and Application*, Springer, 2024.

(The availability of this lecture course depends on whether at least three Warsaw4PhD students are registered.)