



**DOCTORAL SCHOOL OF THE INSTITUTE
OF IMMUNOLOGY AND EXPERIMENTAL THERAPY
POLISH ACADEMY OF SCIENCES**

Rudolfa Weigla 12, 53-114 Wrocław, Poland szkoladoktorska.hirszfeld.pl

Doctoral School Syllabus

Course Title	Microbiology
Form of classes	Lecture
Course coordinator	Prof. dr hab. Anna Pawlik
Lecturers	Prof. dr hab. Sabina Górńska, dr hab. Wojciech Jachymek, dr hab. Ewa Jończyk-Matysiak, dr Magdalena Kotowska, dr Agnieszka Korzeniowska-Kowal, dr hab. Łukasz Łaczmanski, dr hab. Tomasz Niedziela, prof. dr hab. Anna Pawlik, dr hab. Krzysztof Pawlik, dr hab. Mariola Paściak, dr hab. Bogumiła Szponar
Number of hours	20
Subject status	Optional
Languages of classes	English
Entry requirements	Basic knowledge of cell biology, biochemistry, genetics, and molecular biology
Course description	This course provides an overview of contemporary microbiology, with particular emphasis on bacterial physiology, pathogenicity, microbiome interactions, bacteriophages, antimicrobial resistance, synthetic biology, taxonomy, omics technologies, and analytical methods used in microbiological research. The course integrates classical microbiology with modern molecular and biotechnological approaches. Lecture topics: 1. Structure, function, and cellular processes of a bacterial cell. 2. Molecular basis of medical microbiology 3. Human microbiome and its impact on health 4. Biology of bacteriophages and their importance in biotechnology and medicine 5. Antibiotics – activity, synthesis, and resistance 6. Synthetic biology in microbiology 7. Classification and identification of microorganisms 8. Collections of microorganisms 9. Assembling bacterial genomes through the use of hybrid analysis combining Illumina and nanopore sequencing. 10. Mass spectrometry in microbiology and microbial immunochemistry



	11. Chemotyping of bacteria. How can the surface-exposed glycans facilitate the identification of distinct antigenic types of bacteria using the NMR techniques? 12. Microbiological safety 13. Credit seminars
Learning outcomes	P8S_WG (EU1, EU2); P8S_WK (EU5) P8S_UW (EU8); P8S_UK (EU10, EU11)
Method of verification of learning outcomes	1/short written essay (1 page); 2/short talk presentation (3-5 min); 3/class participation, and discussion
Supplementary literature	https://openstax.org/details/books/microbiology - List of Prokaryotic names with Standing in nomenclature (LPSN) provides comprehensive information on the nomenclature of prokaryotes and much more - https://lpsn.dsmz.de/ - Intoduction to Bergey Manual of Systematic Bacteriology 2005 BergeysManualofSystematicBacteriology2ndedVol2PartA2005.pdf - Aggarwal N, Kitano S, Puah GRY, Kittelmann S, Hwang IY, Chang MW. Microbiome and Human Health: Current Understanding, Engineering, and Enabling Technologies. Chem Rev. 2023 123(1):31-72. doi: 10.1021/acs.chemrev.2c00431. - Integrative HMP (iHMP) Research Network Consortium. The Integrative Human Microbiome Project. Nature. 2019 569(7758):641-648. doi:10.1038/s41586-019-1238-8. - Levy M, Kolodziejczyk AA, Thaïss CA, Elinav E. Dysbiosis and the immune system. Nat Rev Immunol. 2017 17(4):219-232. doi: 10.1038/nri.2017.7. - Hou K, Wu ZX, Chen XY, Wang JQ, Zhang D, Xiao C, Zhu D, Koya JB, Wei L, Li J, Chen ZS. Microbiota in health and diseases. Signal Transduct Target Ther. 2022 7(1):135. doi: 10.1038/s41392-022-00974-4.