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| **Course title**  Genetic engineering Laboratory – ERASMUS  Laboratorium inżynierii genetycznej – ERASMUS | | | **ECTS code** |
| **Name of unit administrating study**  Faculty of Chemistry | | | |
| **Studies**   |  |  |  |  | | --- | --- | --- | --- | | **Field of study** | **Type** | **Form** |  | | Chemistry | Bachelor | Full-time studies |  | | Chemistry | Master | Full-time studies |  | | Environmental sciences | Bachelor | Full-time studies |  | | | | |
| **Teaching staff**  Leading teacher: dr Daria Krefft;  Other teachers: dr inż. Joanna Jeżewska-Frąckowiak; dr Joanna Żebrowska; dr hab. Agnieszka Żylicz-Stachula, prof. UG | | | |
| **Forms of classes, the realization and number of hours** | | **ECTS credits 5**  classes 45 h  tutorial classes 40 h  student’s own work 65 h  TOTAL: 150 h - 6 ECTS | |
| 1. **Forms of classes, in accordance with the UG Rector’s regulations**   laboratory classes | |
| 1. **The realization of activities**   In-class | |
| 1. **Number of hours**   45 h - laboratory | |
| **The academic cycle**  summer | | | |
| **Type of course**  facultative | **Language of instruction**  English | | |
| **Teaching methods**  Laboratory experiments | **Form and method of assessment and basic criteria for evaluation or examination requirements** | | |
| **A. Final evaluation, in accordance with the UG study regulations**  Course completion (with a grade) | | |
| **B. Assessment methods**  Laboratory exercise: conducting experiments, report preparation; final test | | |
| **C. The basic criteria for evaluation** or exam requirements  Evaluation criteria in accordance with the UG Studies Regulations; | | |
| **Required courses and introductory requirements**  No formal requirements | | | |
| **Aims of education**  • To become familiar with the basic techniques used in genetic engineering  • To develop the ability to follow procedures for working with genetically modified microorganisms  • To developing the ability to plan and conduct an experiment in the field of genetic engineering and molecular biology  **Convergent to:** - | | | |
| **Course contents**  Basic principles of work in a biotechnology laboratory. Isolation of plasmid DNA, digestion of DNA with restriction enzymes. Electrophoresis of nucleic acids and proteins (acrylamide, agarose). PCR reaction, site-specific mutagenesis - amplification of a DNA fragment carrying the gene. Molecular cloning, preparation of the vector and insert for cloning. DNA purification after enzymatic reactions and electrophoresis. Transformation of competent bacterial cells. Selection of clones on selective media, PCR, restriction analysis, alpha-complementation. Gene expression and protein overproduction in *E. coli* cells. Isolation and purification of protein from a recombinant source, using *E. coli* model. | | | |
| **Bibliography of literature**  1. On-line resources indicated by the lecturer  2. Glick, B.R., Pasternak, J.J., Patten, C.L.: Molecular biotechnology: Principles and applications of recombinant DNA. ASM PRESS, 2009  3. Green M.R., Sambrook J.: Molecular Cloning: A Laboratory Manual, 4th edition, Cold Spring Harbor Laboratory Press, 2012  4. Genomy, Brown T.A., PWN 2019 | | | |
| **Knowledge**  1. Student lists and describes DNA and RNA isolation methods  2. Student can present the theoretical basis of the PCR technique  3. Student lists and characterizes restriction enzymes belonging to various classes and DNA-modifying enzymes and defines enzyme reaction conditions.  4. Student lists and describes the types of vectors used for cloning and their applications.  5. Student lists and describes various expression systems used for the overproduction of proteins in prokaryotic cells  6. Student is able to list and describe the basic methods of purifying recombinant proteins | | | |
| **Skills**  1. Student isolates plasmid DNA  2. Student plans a gene cloning experiment  3. Student performs the separation of nucleic acids using agarose gel electrophoresis and interprets the results of electrophoretic separations  4. Student prepares the insert and vector for cloning and sets the enzymatic reactions  5. Student purifies DNA fragments after enzymatic reactions and after isolation from the gel  6. Student can genetically transform bacteria (chemical and electroporation)  7. Student selects clones using selection media, PCR and restriction enzymes analysis  8. Student overexpresses the gene in the Tabor-Studier system  9. Student purifies recombinant proteins using basic techniques such as liquid chromatography  10. Student complies with established research procedures and procedures for working with genetically modified microorganisms  11. Student performs chemical calculations needed to perform microbiological or biotechnological experiments  12. Student discusses the results obtained during the experiments  13. Student combines knowledge from various fields when reasoning  14. Student talks about microbiological and genetic engineering issues in understandable professional language | | | |
| **Social competence**  1. Student understands the need for further education  2. Student demonstrates creativity in independent and team work  3. Student is careful when dealing with chemical substances and materials of biological origin | | | |