GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Instrumental methods of studying the structure and activity of biomolecules, PG_00053351 | | |
| Field of study | Biomedical Engineering, Biomedical Engineering, Biomedical Engineering | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | 2025/2026 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Specialty subject group<br>Subject group related to scientific research in the field of study |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 2 | Language of instruction | Polish |
| Semester of study | 3 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Sławomir Milewski | |
| | Teachers | | |

| Lesson types and methods of instruction | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 0.0 | 0.0 | 30.0 | 0.0 | 0.0 | 30 |
| | E-learning hours included: 0.0 | | | | | | |
| | Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=14100 | | | | | | |
| | Additional information:<br>Indoor laboratory excercises | | | | | | |

| Learning activity and number of study hours | | | | | |
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| | Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
| | Number of study hours | 30 | 2.0 | 18.0 | 50 |

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| Subject objectives | Making students familiar with practical aspects of modern instrumental methods application in studies on biomolecules |

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems | The student is able to determine a schedule for completing a task, perform these tasks as a member of a group, develop the obtained results and conduct a discussion about them. | [SK5] Assessment of ability to solve problems that arise in practice<br>[SK3] Assessment of ability to organize work |
| | [K7_U53] can apply advanced equipment used in biomedical diagnostics | Student is able to determine conditions of protein purification by FPLC. Student knows the basic rules of running the microcalorimetric experiments, spectrophotometric measurements and by MS and NR spectroscopy | [SU4] Assessment of ability to use methods and tools |
| | [K7_W53] Knows and understands, to an increased extent, selected aspects of biomedical diagnostics. | Student knows the possibilities of application of chromatographic techniques for purification of biomacromolecules. Student knows the rules of choice of spectroscopic methods for examination of structure and activity of biomolecules and is able to use them in practice. | [SW3] Assessment of knowledge contained in written work and projects |
| | [K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study | Student is able to draw conclusions concerning structures of biomolecules based on the results of instrumental analysis | [SW3] Assessment of knowledge contained in written work and projects |

**Subject contents**

1. Analysis od kinetics of protein denaturation by means of differential scanning calorimetry

2. Use of FPLC for isolation and characterisation of biomacromolecules

3. Application of HPLC for isolation of substances of natural origin and examination of antibiotics purity

4. Determination of protein molecular mass by MS-ESI

5. FTIR spectroscopy in examination of protein secondary structure

6. Determination of structure and activity of biomolecules by NMR

7. Examination of biological membranes and transmembrane transport by spectroflurimetry

8. Spectroflurimetric determination of kinetic parameters of protein:ligand interaction

9. Differential UV/vis spectroscopy in DNA:ligand interaction studies

10. Application of surface plasmon resonance in biological studies

**Prerequisites and co-requisites**

Knowledge of Biochemistry at the 1st level studies

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Report | 50.0% | 50.0% |
| Assessment of theory knowledge | 50.0% | 30.0% |
| Practical excercises | 100.0% | 20.0% |

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| Recommended reading | Basic literature | Materials available at the departmental WWW page<br><br>"Instrumentalne metody badania struktury i aktywności biomolekuł", S. Milewski (red), Wydawnictwo PG 2013 |
| | Supplementary literature | Alan Cooper, Chemia biofizyczna, PWN W-wa, 2010 |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | 1. List the ionisation techniques used in mass spectrometry<br><br>2. What absorption bands in UV region are characteristic for proteins?<br><br>3. Which features of medium-pressure liquid chromatography (FPLC) are crucial for the usefulness of this technique for biomolecules separation? | |
| Work placement | Not applicable | |

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