



Laboratory research methods

| 1. IMPRINT | |
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| Academic Year | 2022/2023 |
| Department | Doctoral School |
| Field of study | Medical sciences and health sciences |
| Main scientific discipline <i>(in accord with appendix to the Regulation of Minister of Science and Higher Education from 26th of July 2019)</i> | Medical, pharmaceutical and health sciences |
| Study Profile <i>(general academic / practical)</i> | General academic |
| Level of studies <i>(1st level / 2nd level / uniform MSc)</i> | 3rd |
| Form of studies | Full time studies |
| Type of module / course <i>(obligatory / non-compulsory)</i> | obligatory |
| Form of verification of learning outcomes <i>(exam / completion)</i> | completion |
| Educational Unit / Educational Units <i>(and address / addresses of unit / units)</i> | Chair and Department of Biochemistry |
| Head of Educational Unit / Heads of Educational Units | Prof. dr hab. Marta Struga |

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| Course coordinator (<i>title, First Name, Last Name, contact</i>) | Dr Małgorzata Czystowska-Kuźmicz mczystowska@wum.edu.pl |
| Person responsible for syllabus (<i>First name, Last Name and contact for the person to whom any objections concerning syllabus should be reported</i>) | Dr Małgorzata Czystowska-Kuźmicz mczystowska@wum.edu.pl |
| Teachers | dr. Małgorzata Czystowska-Kuźmicz, mgr inż. Magdalena Długotęcka, mgr Karolina Soroczyńska, prof.dr hab. Sebastian Granica, dr Andrzej Ciechanowicz, dr Vira Chumak |

| 2. BASIC INFORMATION | | | |
|---|-------|-------------------------------|---------------------------------|
| Year and semester of studies | II -V | Number of ECTS credits | |
| FORMS OF CLASSES | | Number of hours | ECTS credits calculation |
| Contacting hours with academic teacher | | | |
| Lecture (L) | | - | |
| Seminar (S) | | 20 | |
| Discussions (D) | | | |
| e-learning (e-L) | | | |
| Practical classes (PC) | | 10 | |
| Work placement (WP) | | | |
| Unassisted student's work | | | |
| Preparation for classes and completions | | | |

| 3. COURSE OBJECTIVES | |
|-----------------------------|---|
| O1 | Solidify students knowledge and skills in basic laboratory methods. |
| O2 | Teaching students modern laboratory techniques |
| O3 | Teaching students how to applicate modern laboratory techniques in scientific research. |

4. EFFECTS OF LEARNING

| Number of effect of learning | Effects of learning in time |
|------------------------------|-----------------------------|
|------------------------------|-----------------------------|

Knowledge – Graduate knows and understands:

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|----|---|
| W1 | - standard laboratory safety rules |
| W2 | - basic laboratory techniques, fundamental laboratory mathematics and data management |
| W3 | - safety rules and basic cell culture technique |
| W4 | - analytical techniques used in modern laboratory |

Skills– Graduate is able to:

| | |
|----|---|
| U1 | - conduct laboratory work in accordance with standard laboratory safety rules; |
| U2 | - carry out basic laboratory techniques like pipetting, making solutions, filtrations, centrifugations, acid-base titration and fundamental laboratory mathematics and data management; |
| U3 | - set up the laboratory for cell culture experiments and apply basic cell culture techniques and methods for passaging, freezing, and thawing cultured cells; |
| U4 | - use analytical laboratory methods such as flow cytometry, enzyme-linked immunosorbent assay (ELISA), liquid chromatography, and mass-spectrometry. |
| U5 | - conduct EV isolation and analysis |

Social Competencies – Graduate is ready for:

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|----|---|
| K1 | Design and carry out research project individual or in team, also in an international environment |
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5. CLASSES

| Form of class | Class contents | Effects of Learning |
|---------------|---|---------------------|
| S1 | Introduction to cell culture | U3,W4 |
| S2 | Cell cultures – continuation | U3,W4 |
| S3 | Selected research methods used in scientific laboratories- protein gel electrophoresis and DNA gel electrophoresis | U2, U4 W2, W4 |
| S4 | Selected research methods used in scientific laboratories – continuation-- Enzyme-linked immunosorbent assay (ELISA) and flow cytometry | U2,U4 W2,W4 |
| S5 | The application of flow cytometry in scientific research | U4,W4 |

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|-----|--|-------------|
| S6 | Extracellular vesicles (EVs) – powerful little messengers as a new paradigm in cell biology and medicine | U4, W4 |
| S7 | The application of modern chromatographic techniques in scientific | U4, W4 |
| S8 | Proteomics, Metabolomics and Lipidomics | U4,W4 |
| PC1 | Basic laboratory methods | U1-U2,W1-W2 |
| PC2 | Introduction to mammalian cell culture | U3,W3 |
| PC3 | Flow cytometry | U4,W4 |
| PC4 | EV isolation and analysis | U5, W4 |

6. LITERATURE

Obligatory

Materials on the e-learning platform prepared by the Department of Biochemistry

Supplementary

Medical database and professional medical journals, Pubmed, Embase, Scopus, Web of Science

7. VERIFYING THE EFFECT OF LEARNING

| Code of the course effect of learning | Ways of verifying the effect of learning | Completion criterion |
|---------------------------------------|---|--|
| <i>e.g. A.W1,A.U1,K1</i> | <i>This field defines the methods used for grading students e.g. pop quiz, test, written report etc.</i> | <i>e.g. threshold number of points</i> |
| | Discussion with an assistant: attendance, activity, realization of the topic, manual work, answering to the questions of an assistant | Positive evaluation by the teacher |
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8. ADDITIONAL INFORMATION (*information essential for the course instructor that are not included in the other part of the course syllabus e.g. if the course is related to scientific research, detailed description of, information about the Science Club*)