

COURSE UNIT DESCRIPTION - MOLECULAR BIOLOGY OF CELL SIGNALING

| Course unit title | Code |
|-------------------------------------|------|
| MOLECULAR BIOLOGY OF CELL SIGNALING | |

| Lecturer(s) | Department(s) |
|--|---|
| Coordinator: dr. Mindaugas VALIUS Other(s): | Institute of Biochemistry of Vilnius University, Mokslininkų 12, LT-08662 Vilnius |

| Cycle | Level of the course unit | Type of the course unit |
|---|--------------------------|-------------------------|
| Full-time studies (2 nd stage) | 1 out of 1 | Elective |

| Mode of delivery | Period of delivered | Language(s) of instruction |
|------------------|----------------------------------|----------------------------|
| Face to face | 2 nd semester, spring | Lithuanian |

| Prerequisites and corequisites | |
|--|-------------------------------|
| Prerequisites: Biochemistry, organic chemistry, genetics | Corequisites (if any): |

| Number of credits allocated to the course unit | Student's total workload | Contact hours | Self-study and research hours |
|--|--------------------------|---------------|-------------------------------|
| 4 | 107 | 48 | 59 |

| Purpose of the course unit: programme competences to be developed | | |
|--|--|--|
| <p>Upon the successful completion of this course, students will acquire:</p> <p><i>Subject-specific competences:</i></p> <ul style="list-style-type: none"> • knowledge and understanding of intercellular and intracellular signal propagation and management principles at the molecular level; • knowledge and understanding of cellular signaling advanced research approaches; • skills to use research knowledge and practical activities to solve scientific problems related to cell regulation; • skills to analytically, critically and systemically analyze and evaluate information related to cellular signaling; • skills to integrate knowledge of different scientific fields to solve molecular cell biology-related problems; <p><i>General competences:</i></p> <ul style="list-style-type: none"> • analytical and synthetic thinking; • skills for self-development, study skills in order to study molecular cell biology; • skills to present in written and verbal forms the knowledge on the cellular signaling; • skills to participate in the scientific discussion. | | |
| Learning outcomes of the course unit | Teaching and learning methods | Assessment methods |
| <ul style="list-style-type: none"> • Describes how cell functioning is regulated at the molecular level, how errors in such regulation result into main diseases; • Designs an experiment and solves actual scientific problems related to the regulation of cell functioning by applying modern methods and new technologies; • Demonstrates ability to use bioinformatics data bases and tools and skills in reading schemes of cell signaling pathways; | Lectures, seminars, problem-based learning, self-study | Midterm exam; Topic-related seminar presentation; Exam |

| Content: breakdown of the topics | Contact hours | Self-study work: time and assignments |
|----------------------------------|---------------|---------------------------------------|
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| | Lectures | Tutorials | Seminars | Exercises | Laboratory work | Internship/work placement | Contact hours | Self-study hours | Assignments |
|---|-----------|-----------|-----------|-----------|-----------------|---------------------------|---------------|------------------|---|
| 1. Over review of the subject: cellular signaling | 4 | | 2 | | | | 6 | 5 | Analysis of the topic-related scientific literature; seminar presentation, self-directed learning. |
| Principles of cell regulation | 2 | | | | | | 2 | 2 | |
| Experimental approaches to study cell regulation | 2 | | 2 | | | | 4 | 3 | |
| 2. Ligand-receptor interactions in cellular regulation | 6 | | 2 | | | | 8 | 10 | Analysis of the topic-related scientific literature; seminar presentation, self-directed learning. |
| Ligands: growth factors, antigens, cytokines | 2 | | | | | | 2 | 5 | |
| Receptors: growth factor receptors, antigen receptors, cytokine receptors | 4 | | 2 | | | | 6 | 5 | |
| 3. Signaling pathways. | 10 | | 2 | | | | 12 | 20 | Analysis of the topic-related scientific literature; seminar presentation, self-directed learning. |
| Canonical signaling pathways | 8 | | 2 | | | | 10 | 18 | |
| Non-canonical signaling pathways | 2 | | | | | | 2 | 2 | |
| 4. Regulation of major cellular processes | 6 | | 6 | | | | 12 | 14 | Analysis of the topic-related scientific literature; seminar presentation, self-directed learning.. |
| Signaling pathways in the regulation of cell movement | 2 | | 2 | | | | 4 | 4 | |
| Signaling pathways in the regulation of cell proliferation and growth | 2 | | 2 | | | | 4 | 6 | |
| Signaling pathways in the apoptosis regulation | 2 | | 2 | | | | 4 | 4 | |
| 5. OMICS and cell signaling | 6 | | 4 | | | | 10 | 10 | Analysis of the topic-related scientific literature; seminar presentation, self-directed learning. |
| Genomics in the research of cell signaling | 2 | | 2 | | | | 4 | 5 | |
| Proteomics in the research of cell signaling | 4 | | 2 | | | | 6 | 5 | |
| Total | 32 | | 16 | | | | 48 | 59 | |

| Assessment strategy | Weight, % | Assessment period | Assessment criteria |
|---------------------|-----------|------------------------------------|---|
| Midterm exam | 20 | 8 th week of the course | Test (answer the questions in writing and orally) of 5 questions from the topics 1 -2. Understanding less than 25% of the subject - 2-4 (insufficient) |

| | | | |
|---|-----|---------------------------------------|--|
| | | | Understanding 25 % of the subject - 5 (sufficient) Understanding 25-29 % of the subject -6 (satisfactory) Understanding 30-39 % of the subject - 7(highly satisfactory) Understanding 40-59 % of the subject -8 (good) Understanding 60-79 % of the subject -9 (very good) Understanding 80-100 % of the subject -10 (excellent) |
| Topics 1-5 -related seminar presentations | 20 | 2-15 th week of the course | 2-4 (insufficient) 5 (sufficient) 6 (satisfactory) 7(highly satisfactory) 8 (good) 9 (very good) 10 (excellent) |
| Final Exam | 60 | 16 th week of the course | It is obligatory to present topic-related seminar before the exam. Test (answer the questions in writing and orally) of 10 questions from the topics 3 - 5. Understanding less than 25% of the subject - 2-4 (insufficient) Understanding 25 % of the subject - 5 (sufficient) Understanding 25-29 % of the subject -6 (satisfactory) Understanding 30-39 % of the subject - 7(highly satisfactory) Understanding 40-59 % of the subject -8 (good) Understanding 60-79 % of the subject -9 (very good) Understanding 80-100 % of the subject -10 (excellent) |
| Total | 100 | | Seminar and exam parts each must be completed with the minimal evaluation (sufficient, 5) to obtain the final evaluation. The final grade is the sum of two evaluated parts. |

| Author | Year of publication | Title | Issue of a periodical or volume of a publication | Publishing place and house or web link |
|-----------------------------------|---------------------|--|--|--|
| Compulsary reading | | | | |
| Krauss, G | 2008 | Biochemistry of signal transduction and regulation. 4 th ed | | John Wiley and Sons |
| Alberts et al. | 2008 | Molecular Cell Biology. 6 th | | W. H. Freeman and Company |
| Optional reading | | | | |
| Topic-related scientific reviews. | 2008-2013 | Nature Reviews Molecular Cell Biology | Topic-related scientific reviews. | 2008-2013 |

