SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş-Bolyai University
1.2 Faculty	Faculty of Biology and Geology
1.3 Department	Department of Molecular Biology and Geology
1.4 Field of study	Biology
1.5 Study cycle	Master
1.6 Study programme / Qualification	Molecular biotechnology/Masters' degree

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)	Name of the Discipline (EN): Cellular signaling Numele disciplinei (RO): Semnalizări celulare						
2.2 Course coordinator	Șef lucr. Dr. Anca Daniela Stoica						
2.3 Seminar coordinator	Șef lucr. Dr. Anca Daniela Stoica						
2.4 Year of study	1	2.5 Semester	1	2.6. Type of evaluation	C	2.7 Type of discipline	DS
2.8 Code of the discipline	BME1303						

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.2 course	28	3.6 seminar/laboratory	28
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					73
Additional documentation (in libraries, on electronic platforms, field documentation)					10
Preparation for seminars/labs, homework, papers, portfolios and essays					10
Tutorship					3
Evaluations					2
Other activities:					

3.7 Total individual study hours	98
3.8 Total hours per semester	154
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1 Curriculum	Biochemistry, Cellular and Molecular Biology
4.2 Competencies	• The ability to select, read, understand and process scientific information; • The ability to use scientific information in a given context; • Experimental design.

5. Conditions (if necessary)

5.1 For the course	• Multimedia support (Microsoft Teams, Zoom etc.)

5.2 For the seminar activities	• Attending at least 80% of the seminars, defending and submitting the paper are conditions for attending the final exam.

6. Specific competencies acquired

Professional competencies	• To identify the role of cell signaling in regulation of body functions; • Understanding the universality, specificity and complexity of cellular signaling processes; • The ability to design an experiment based on investigation methods in the field of cellular signaling;
Transversal competencies	• Developing the ability to use information regarding the signaling pathways studied for understanding cellular differentiation, development and coordination of the organism; • Using already known data in new contexts; • The use of theoretical data in solving practical problems.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	Understanding the principles of intra- and intercellular signaling, as well as the cellular/tissue specificity of these mechanisms.
7.2 Specific objective of the discipline	- To identify the intra- and intercellular communication mechanisms and the integration of acquired data into basic concepts; - To explain, using the interactions between signal molecules and membrane receptors, the triggering of specific cellular processes; - To describe the methods of regulation and coordination of cellular functions, as well as the functional particularities of different cell types;

8. Content

8.1 Course	Teaching methods	Remarks
1. Cellular signaling – introduction. The types of inter- and intracellular communication. Communication through surface markers. Communication through specific membrane areas. Protein domains and modules.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
2. Cellular signaling concept. Primary messengers, receptors, secondary messengers.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
3. 7-TM receptors. G proteins. Enzymes that bind G proteins: adenylate cyclase and phospholipases. Desensitization of receptors. Internalization of membrane receptors. Ubiquitination and protein degradation in proteasomes.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
4. 7-TM receptors that have inositol-1,4,5-triphosphate as a	frontal lecture, problematization,	

second messenger. Phospholipases and cell signaling - characterization: substrate, classification. Phospholipases and cell signaling.	learning by discovery, heuristic conversation, critical thinking	
5 and 6. Calcium signaling. Cellular processes involving calcium. Interaction with other signaling pathways. OFF mechanisms that stop calcium signaling. Global aspects of calcium signaling.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
7. CaMKII and the involvement of calcium in memory processes. CaMKII structure and function. CaMKII activation. CaMKII in the induction of LTP. The mechanism of synaptic potentiation mediated by CaMKII.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
8 and 9. Receptors that dimerize. Receptor tyrosine kinases (RTKs). Receptor activity in endosomes. Tyrosine kinases that have no receptor function. Protein kinase inhibitors - effective anticancer drugs.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
10. TGFβ signaling. Receptors for TGFβ. Oncoproteins and I-Smad. Absence of TGFβ signaling, abnormal proliferation and malignancy.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
11. Cell signaling through adhesion molecules. The extracellular matrix. Adhesion molecule superfamilies. Caderines. Polarity of cells and tissues. Cell movements.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
12. Wnt/Frizzled signaling. Aspects of Wnt signaling in development.	frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
13. Signaling by MAP kinases. The role of MAPK in regulating the activity of transcription factors that control fast-response genes. MAPK involvement in the mating pathway in yeast. Anchor proteins that isolate MAPK signaling pathways in eukaryotic cells.	Frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	
14. Signal transduction in programmed cell death. Molecular mechanisms of apoptosis. The role of mitochondria in apoptosis. The Bcl-2 family of proteins. Involvement of caspases in apoptosis. The JNK-dependent apoptotic signaling pathway kinase.	Frontal lecture, problematization, learning by discovery, heuristic conversation, critical thinking	

Bibliography

1. Hancock, J.T., 2005: Cell Signalling, 2nd ed., Oxford University Press.
2. Gomperts, B.D., 2003, Signal transduction, Elsevier Academic Press.
3. Beckerman, M., 2005, Molecular and Cellular Signaling, Springer.

8.2. Seminar / laboratory	Teaching methods	Remarks
Students write reports on a topic of their choice, which they will have to present to colleagues. Each presentation is followed by discussions in which all the students of the group are involved. The paper is presented in the form of a .ppt presentation, and the full paper is handed to the teacher.	Presentation of the paper; discussions; Presentation of activities and discussions on the electronic platform	

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course has a content similar to the courses from other Romanian and foreign universities, with information constantly updated and adapted to different levels of training.
- The course is structured so that the teaching methods require the activity of the students in the course, encouraging the individual study, form psycho-cognitive skills to practical skills.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Understanding the theoretical contents	Written exam	70%
	Ability to use information in a new context		
10.5 Seminar/lab activities	Preparation and presentation of a paper	Evaluation of the written report and its presentation	30%
10.6 Minimum performance standards			
• Understanding of 50% of the information contained in the course • Understanding of 50% of the information contained in the seminar • Preparation of an original paper			

Date	Signature of course coordinator	Signature of seminar coordinator
16.07.2024	Șef lucr. Dr. Anca Daniela Stoica	Șef lucr. Dr. Anca Daniela Stoica

Date of approval	Signature of the head of department
16.07.2024	Conf. Dr. Beatrice Kelemen