COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Plant Signaling and Behavior	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Assoc. Prof. dr. Vilma Kisnieriene **Other(s):**	Life Science Center, Department of Neurobiology and Biophysics

Study cycle	Type of the course unit (module)
First, second, third	Elective

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face-to-face	Semester	English

Requirements for students	
Prerequisites: Basic knowledge of plant biology	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	130	48	82

Purpose of the course unit (module): programme competences to be developed

The aim of present course to learn the ways that plants sense, interact, communicate, learn, develop, survive and grow in an ever-changing world.

- Ability to increase knowledge that is necessary to continue further an independent study.
- Ability to understand and explain signaling role in plant ecosystems, principles of living systems functioning in molecular, cellular and system level, and the ability to apply this knowledge in the scientific and practical problems.
- The ability to use information and data sources , the use of information technology

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
Will understand and compare differences and functions of the signaling systems in plants	Lectures, problem-oriented self-study, computer simulation scientific literature reading, discussion on seminars, laboratory work	Exam, Continuous evaluation during seminars and participation in the discussions, practical laboratory work defending.
Will know the ways that plants sense and percept the external environment.	Lectures, problem-oriented self-study, computer simulation scientific literature reading, discussion on seminars	Exam, Continuous evaluation during seminars and participation in the discussions, practical laboratory work defending.
Will understand and explain plant responses to biotic and abiotic stresses, plant defense systems.	Lectures, problem-oriented self-study, computer simulation scientific literature reading, discussion on seminars	Exam, Continuous evaluation during seminars and participation in the discussions, practical laboratory work defending.
Will understand and explain communication mechanisms in plants and plant behavior as a complex of responses to external or internal stimuli.	Lectures, problem-oriented self-study, computer simulation scientific literature reading,	Exam, Continuous evaluation during seminars and participation in the discussions, practical

	discussion on seminars	laboratory work defending.
Will know the principles and limitations of the basic electrophysiological research methods in plants.	Discussion on seminars, laboratory work	Continuous evaluation during seminars and participation in the discussions, practical laboratory work defending.

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	Contact hours	Self-study hours	Assignments
1. Chemical and electrical ways of signaling and its physiological function in plants.	2		2		2		**6**	**11**	Textbooks and scientific literature reading, presentation, seminar discussions. Laboratory work performing and defending.
2. Plant cell-signaling systems. Plant receptors. Signal transduction in plants.	2		2		2		**6**	**11**	Textbooks and scientific literature reading, presentation, seminar discussions. Laboratory work performing and defending.
3. Information spreading after pathogen attack and wounding throughout the plant and between them.	4		2				**6**	**12**	Textbooks and scientific literature reading, presentation, seminar discussions.
4. Root behavior in response to stresses, perception of stressors and the ability to decode environmental signals	4		4				**8**	**12**	Textbooks and scientific literature reading, presentation, seminar discussions.
5. Communication networks in plants. Kin recognition. Different problem solving strategies in ecosystems.	4		4				**8**	**12**	Textbooks and scientific literature reading, presentation, seminar discussions.
6. Carnivorous plants, plants in extreme environment and ordinary plants as model systems for plant behavior investigations.	4		2				**6**	**12**	Textbooks and scientific literature reading, presentation, seminar discussions.
7. Memory, decision-making, intelligence in plants	4		4				**8**	**12**	Textbooks and scientific literature reading, presentation, seminar discussions.
Total	**24**		**20**		**4**			**82**	

Assessment strategy	Weigh t,%	Deadline	Assessment criteria
Practical laboratory work performing and defending.	20 %	Until Exam	Laboratory works performed. Student formulates problems. Properly answers the questions -10 points. Laboratory work performed. Student formulates problems. Properly answers half questions -8 points Laboratory work performed. Student formulates problems. Poor response to questions -5 points

			Laboratory work performed. Student do not formulates problems. Poor response to questions -3 points Laboratory work did not performed - 0p
Participation in the discussions.	10%		Student takes a part in discussion every lecture and seminar -10 points, in half of lectures and seminars -5 points, student do not takes a part in discussions 0 points.
Presentation	20 %	Until Exam	Information presentation in a systemic, clear way: 0-4 points; Literature understanding, problem understanding, critical comments: 0-4 points. Answers to questions: 0-2 points.
Exam	50 %	During exam session	Answer to the basic question: 0-5 points; Comparisons of specific signalling pathways in plants: 0-4 points (0-2 points for each pathways); Answers to additional questions: 0-1 points.

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsary reading				
Frantisek Baluška, Dieter Volkmann, Stefano Mancuso (Ed.).	2006,	Communication in Plants: Neuronal Aspects .		Springer, http://www.springer.com/gp/book/9783540284758
Frantisek Baluška (Ed).	2009	Plant- environment interactions		Springer https://link.springer.com/book/10.1007%2F978-3-540-89230-4
Optional reading				
Vadim Demidchic, Frans Maathuis (Ed).	2010	Ion Channels and Plant Stress responces		Springer https://link.springer.com/book/10.1007%2F978-3-642-10494-7
Selected scientific papers for seminars and readings				