Course Unit Descriptor

Study Programme: Master Academic Studies (MAS) – Molecular and Functional Biology
Course Unit Title: Physiological and Molecular Basis of Plant Stress
Course Unit Code: Elective
Name of Lecturer(s): Danijela Arsenov, Milan Borišev
Type and Level of Studies: Master Academic Studies (MAS) – Molecular and Functional Biology
Course Status (compulsory/elective): elective
Semester (winter/summer): winter or summer
Language of instruction: English or Serbian
Mode of course unit delivery (face-to-face/distance learning):
Number of ECTS Allocated: 7
Prerequisites: None
Course Aims: The aim of the course is to introduce students to the fundamental physiological and molecular mechanisms that control plant responses to various abiotic and biotic stressors. The course enables students to acquire basic principles of plant responses to different external stimuli that disrupt cellular homeostasis and affect vital processes in plants.
Learning Outcomes: Upon successful completion of the course, students will acquire theoretical knowledge and become familiar with current methods used in stress perception, signal transduction of various stressors, and detection of plant responses to stress. Theoretical and practical teaching will provide insight into the mechanisms and strategies used by plants to adapt to changing environmental conditions. Students will be able to apply the acquired knowledge in analyzing the effects of different stressors on plants, metabolic and genetic stress-response pathways, and in determining the flexibility of acclimatization of different plant species to environmental factors.
Syllabus: *Theory:* The theoretical component of the course covers the main types of plant stressors, including oxidative and osmotic stress, and focuses on the mechanisms of stress perception and signal transduction. Emphasis is placed on plant defense strategies such as maintenance of cellular homeostasis, detoxification, and resistance. Students gain insight into the physiological and molecular basis of plant tolerance to abiotic stressors (temperature extremes, water deficit, heavy метал stress) and biotic stressors (pathogens and herbivores), as well as the interaction and integration of multiple stress signals in plants. *Practice:* The practical component includes experimental design for assessing the effects of selected abiotic stressors on antioxidant metabolism and stress-gene expression. Students perform preparation of plant extracts, determination of antioxidant enzyme kinetics, analysis of non-enzymatic antioxidant parameters, lipid peroxidation, reactive oxygen species (ROS) content, membrane permeability, etc. Practical work also includes molecular analyses such as RNA isolation, cDNA synthesis, and gene expression analysis of selected stress-related genes, followed by data processing, statistical analysis, and seminar preparation.
Required Reading: Madhava Rao KV, Raghavendra, AS, Janardhan Reddy K. 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer. – одабрана поглавља Shabala S. 2017. Plant stress physiology. 2nd edition. CABI.

Weekly Contact Hours:	**Lectures: 2**	**Practical work: 2+0+2**

Teaching Methods: Theoretical and experimental teaching (practical classes, exercises)

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	40
Practical work		oral exam	30
Preliminary exam(s)		…….	
Seminar(s)	20		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.