



DETAILED SYLLABUS

Plant Molecular Physiology and Biochemistry

Academic year: 2024-2025

1. Information about the study program

1.1 University	“Babeş-Bolyai” University of Cluj-Napoca
1.2 Faculty	Faculty of Biology and Geology
1.3 Department	Molecular Biology and Biotechnology
1.4 Field of study	Biology
1.5 Program level (bachelor or master)	Master degree
1.6 Study program / Qualification	Molecular Biotechnology (MB)

2. Information about the subject

2.1 Subject title	Plant Molecular Physiology and Biochemistry BME 1305						
2.2 Course activities professor	Associate Prof. dr. Dorina Podar						
2.3 Seminar activities professor	Associate Prof. dr. Dorina Podar						
2.4 Year of study	II	2.5 Semester	3	2.6 Type of assessment	C	2.7 Subject regime	DS

3. Total estimated time (teaching hours per semester)

3.1 Number of hours per week	11	out of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total number of hours in the curriculum	154	out of which: 3.5 course	28	3.6 seminar/laboratory	28
Time distribution					Hours
Study based on textbook, course support, references and notes					50
Additional documentation in the library, through specialized databases and field activities					24
Preparing seminars/laboratories, essays, portfolios and reports					24
Tutoring					10
Assessment (examinations)					4
Others activities					
3.7 Total hours for individual study	98				
3.8 Total hours per semester	154				
3.9 Number of credits	6				

4. Preconditions (if necessary)

4.1 Curriculum	General Biochemistry, Biochemistry of carbohydrates, Biochemistry of proteins, Biochemistry of lipids, Biochemistry of nucleic acids, and also preferable Histology and Anatomy of Plants, Plant Physiology
4.2 Skills	None

5. Conditions (if necessary)

5.1. For course development	None
5.2. For seminar / laboratory development	Deadlines set for home assignments and oral examinations may be overcome only if there are reasonable grounds.

6. Acquired specific competences

Professional competences	<ul style="list-style-type: none"> • Use and explain fundamental concepts and principles of plant structure and function. • Use and explain the interactions between plants and environment, and plant physiological and biochemical mechanisms of adaptation. • Ability to understand and interpret scientific papers regarding Plant Physiology and Biochemistry, to follow and understand the steps of an experimental set-up, i.e. identify the research problem, elaborate the hypothesis, select the right tools and methods for the experiment, identify the right ways to interpret and present the results and discuss them in the context of others research results. • Use theoretical knowledge to solve practical problems. • Use of creativity in using techniques. • Design experimental and organisational structures. • Influence other people by using scientific arguments and tools. • Develop effective information systems.
Transversal competences	<ul style="list-style-type: none"> • Demonstrate responsibility and efficiency in performing professional tasks and respect the principles of professional ethics and deontology. • Undertake research involvement, such as documenting, developing literature syntheses, possibly of essays and articles. • Participate in scientific projects and demonstrate the ability to identify training opportunities for their future.

7. Subject objectives (arising from the acquired specific competences)

7.1 Subject's general objective	<ul style="list-style-type: none"> • identify and analyses the physiological, biochemical and molecular aspects of the plant cell and organism functioning and acquiring basic principles on the use of physiological, biochemical and molecular laboratory techniques and methods with applications in plant research. Identifying possible external or internal (genetic) causes of metabolic changes with significance in diagnosis.
7.2 Specific objectives	<ul style="list-style-type: none"> • understand and adequately use fundamental concepts and principles terminology of Plant Molecular Physiology and Biochemistry • define and classify the main groups of biomolecules and physiological processes in which they are involved • use knowledge on the functioning of living matter at cellular and molecular level in fundamental scientific and technological applications • achieve the ability to transfer information using knowledge from related fields of Molecular Biology and Physiology • use of fundamental concepts for analysis and interpretation of results of physiological and molecular analysis in plant research • integrate algorithms and models of investigation that are characteristic for plant study • apply general knowledge of organic chemistry, biochemistry, biotechnology, of analysis of physiological and molecular processes to elaborate aspects to be researched and investigated in the laboratory • understand the principles of the main methods and laboratory techniques used for Plant Physiology and Molecular Biology • analyse case studies of plant metal transporters • efficient use of information sources and communication and training resources (Internet portals, specialized software applications, databases, on-line courses, etc.) both in Romanian and English.

8. Contents

8.1 Course	Teaching methods	Observations
I-II. Genome organization in plants. Control of gene expression, epigenetics.	lecture, stimulating interactivity and problem-solving	
III. Methods for studying localization, function and activity of genes. Genetic technologies used in plant studies.	lecture, stimulating interactivity and problem-solving	
IV. Signal transduction in plants.	lecture, stimulating interactivity and problem-solving	
V. Plant defence against pathogens (bacteria, viruses, fungi, nematodes). Plant immunity.	lecture, stimulating interactivity and problem-solving	
VI. Interactions between plants and their symbionts (bacteria and fungi).	lecture, stimulating interactivity and problem-solving	
VII-XII. Plant hormones: auxin, gibberellins, cytokines, strigolactones, salicylic acid, ethylene (Molecular mechanisms of their synthesis, signalling and roles. Applications for agriculture).	lecture, stimulating interactivity and problem-solving	
XIII. Senescence and programmed cell death.	lecture, stimulating interactivity and problem-solving	
XIV. Application of plant molecular technologies.	lecture, stimulating interactivity and problem-solving	
8.2 Seminar/laboratory	Teaching methods	Observations
The laboratory is organized modularly interspaced with seminars. Includes: media preparation, plant cultivation <i>in vitro</i> under different conditions, extraction of RNA and gDNA, amplification, cloning, plasmid extraction, GUS staining observation. Students will present a research paper as a Journal Club.	Apply terminology and understanding from taught courses and integrate with knowledge from other disciplines, discussion and interpretation, frontal questions, presentation by students, writing a report.	
References:		
<ol style="list-style-type: none"> 1. Buchanan, B., Gruissem, W., Jones, R. Eds (2015) <i>Biochemistry and Molecular Biology of Plants</i>, John Wiley & Sons, Ltd. 2. Heldt, H-W. (1997) <i>Plant Biochemistry & Molecular Biology</i>, Oxford University Press. 3. Lodish, H., Berk, A., Kaiser C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H., Matsudaira, P. (2008), <i>Molecular Cell Biology</i>, 6th Edition, W.H. Freeman and Company. 4. Ougham, J., Waaland, T. Eds (2013). <i>The Molecular Life of Plants</i>, John Wiley & Sons, Ltd. 5. Podar, D. <i>Plant Molecular Physiology and Biochemistry – course support – printed material</i>. 6. Taiz & Zeiger Eds (2010), <i>Plant Physiology</i>, 5th ed., Sinauer Associates, Inc. Papers (cited on the slides or in the course support, etc.) Bibliography, except the course support that is given by the teacher, not available in BCU is available for consultation in room 63, based on an appointment with the teacher.		

9. Corroboration / validation of the subject's content in relation to the expectations coming from representatives of the epistemic community, of the professional associations and of the representative employers in the program's field.

- Course content is consistent with what is taught in other universities in Romania, Europe and USA.
- Content of the course focuses on aspects of plant physiology and molecular biochemistry, referring to aspects of plants related to their cultivation, use and manipulation, thus having an applicative character.
- Through the activities performed, students develop skills to provide solutions to problems and to propose ideas for improving the existing situations regarding plants including crops.

10. Assessment (examination)

Type of activity	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Knowledge of general and specific concepts of plant physiology and biochemistry.	• Written final examination (test including multiple-choice)	60%

	Ability to use information within a new context.	questions, open-ended questions, explanation, interpret results items)	
10.5 Seminar/laboratory	Knowledge of informational content. The ability to use information in a new context. Ability to interpret the observations made. Solving the application exercises. Class participation. Making decision in a rational way (home assignments). Journal Club presentation	<ul style="list-style-type: none"> • Paper presentation (as a Journal Club) • Monitoring student, participation to discussions. • Class activity portfolio. 	40%
10.6 Minimum performance standard			
<ul style="list-style-type: none"> • It is necessary to obtain a minimum grade of 5 (five) to pass this subject; • Achieved and oral presentation of the theme chosen in compliance with the given structure and the principles of professional ethics. • The grades being granted are between 1 (one) and 10 (ten); • The written test takes approximately 120 minutes. 			

Date of completion
11.07.2024

Course professor
Reader dr. Dorina Podar

Laboratory/Seminar professor
Reader dr. Dorina Podar

Date of approval by the department
16.07.2024

Head of department
Reader dr. Beatrice Kelemen