SYLLABUS

Plant Molecular Physiology and Biochemistry

University year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	Babeş-Bolyai University
1.2. Faculty	Faculty of Biology and Geology
1.3. Department	Molecular Biology and Biotechnology
1.4. Field of study	Biology
1.5. Study cycle	Master degree
1.6. Study programme/Qualification	Molecular Biotechnology
1.7. Form of education	With frequency

2. Information regarding the discipline

2.1. Name of the discipline	Plant Molecular Physiology and Biochemistry					Discipline code	BME1305
2.2. Course coordinator	Assoc. Prof. dr. Dorina Podar						
2.3. Seminar coordinator	Assoc. Prof. dr. Dorina Podar						
2.4. Year of study	2	2.5. Semester	3	2.6. Type of evaluation	C	2.7. Discipline regime	Optional

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: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
Learning using manual, course support, bibliography, course notes (SA)					42
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					10
Evaluations					6
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	Preferably good knowledge of 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. competencies	None

5. Conditions (if necessary)

5.1. for the course	• Attendance in at least 30% of the courses is a condition for participation in the exam
5.2. for the seminar /lab activities	• Attendance in at least 90% of the laboratory activities is required • Attendance to the lab evaluation is required and compulsory

6. Specific competencies acquired

Professional/essential competencies	• 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 discus 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 competencies	• 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. • Ability to analyse and interpret experimental results and to formulate appropriate, reasoned conclusions • Participate in scientific projects and demonstrate the ability to identify training opportunities for their future.

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

7.1 General objective of the discipline	• 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 objective of the discipline	• 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.).

8. Content

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 *in vitro* under different conditions, extraction of RNA and gDNA, amplification, cloning, plasmid extraction, GUS staining and 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.	Attendance is compulsory

References:

1. Buchanan, B., Gruissem, W., Jones, R. Eds (2015) Biochemistry and Molecular Biology of Plants, John Willey & Sons, Ltd.
2. Heldt, H-W. (1997) Plant Biochemistry & Molecular Biology, Oxford University Press.
3. Lodish, H., Berk, A., Kaiser C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H., Matsudaira, P. (2008), Molecular Cell Biology, 6th Edition, W.H. Freeman and Company.
4. Ougham, J., Waaland, T. Eds (2013). The Molecular Life of Plants, John Willey & Sons, Ltd.
5. Podar, D. Plant Molecular Physiology and Biochemistry – course support – printed material.
6. Taiz & Zeiger Eds (2010), Plant Physiology, 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. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- 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. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Knowledge of general and specific concepts of plant physiology and biochemistry.	Written final examination (test including multiple-choice questions, open-ended questions, explanation, interpret results items)	60%
	Ability to use information within a new context.		

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	• Paper presentation (as a Journal Club) • Monitoring student, participation to discussions. • Class activity portfolio.	40%
10.6 Minimum standard of performance			
• 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.			

11. Labels ODD (Sustainable Development Goals)[1]

								

Date:
10.01.2025

Signature of course coordinator

Assoc. Prof. Dr. Dorina Podar

Signature of seminar coordinator

Assoc. Prof. Dr. Dorina Podar

Date of approval:
17.01.2025

Signature of the head of department

Assoc. Prof. Dr. Beatrice Kelemen

[1] Keep only the labels that, according to the *Procedure for applying ODD labels in the academic process*, suit the discipline and delete the others, including the general one for *Sustainable Development* – if not applicable. If no label describes the discipline, delete them all and write „*Not applicable*.".