

Module name	Plant physiology – a basic course
Module code	B-BT.012
ISCED code	0511: Biology
Study cycle	I ^o
Semester	summer
Responsible for this module	Małgorzata Wójcik Department of Plant Physiology and Biophysics email: mwojcik@umcs.pl
Language of instruction	English
Website	
Prerequisites	-
ECTS	5
ECTS points hour equivalents	Contact hours (work with an academic teacher) – 60 - lectures: 30 - labs: 30 Non-contact hours (students' own work) – 70 - preparation for the exam: 20 - preparation for partial tests: 20 - preparation for labs: 5 - preparation of reports from laboratory exercises: 10 - literature study: 15 Total number of ECTS points for the module - 5
Learning outcomes verification methods	Lecture: - written examination (W1, W2, U3, K2) Laboratories: - Intermediate short tests (W1, W2, U3, K2) - reports on experiments and observations during laboratory exercises (W3, U1, U2, K1)
Course full description	During the lecture the student will learn about the basic processes responsible for the functioning of the plant organism as a whole, their mechanisms, regulation and dependence of these processes on environmental factors. He will learn about the possibilities and examples of modifying physiological processes in plants using biotechnological tools and the benefits and risks of such manipulations. - Basic issues related to water management: water intake, transport, transpiration. - Mineral nutrition: the role of macro- and microelements, element uptake and short- and long-distance transport, mechanism of nitrogen fixation and assimilative reduction of nitrates, examples of symbiosis in the uptake of mineral substances by plants. - Photosynthesis: photosynthetic pigments, light and dark phases reactions, assimilation of CO₂ in C₃ and C₄, CAM plants. - Donors and acceptors of assimilates, transport of assimilates in the plant. - Respiration: stages of aerobic respiration and their

	course, mechanism of oxidative and substrate phosphorylation. - Plant growth and development: growth phases, growth location, development stages, seed dormancy, germination, vegetative and generative development, flowering induction, role of phytochrome in physiological processes. - Plant hormones, activators and inhibitors, their roles. - Plant movements, types, mechanisms, examples. - Plant biologically active substances, role in the adaptation of plants to the environment and practical importance for a man. During laboratory exercises, the student will perform experiments and observations on his own to better understand physiological processes taking place in plants. The exercises are performed according to the instructions presented in the scripts and under the supervision of the teacher. The student will perform six laboratory exercises selected from the list of exercises below, at least one exercise from each of five sections. Section I. Water management - Diffusion and osmosis. Traube's artificial cells. - Osmotic relations of a plant cell: influence of chemical and physical factors on cell membrane permeability; plasmolysis, deplasmolysis. - Water uptake, transport and transpiration: measurement of water uptake by potometric method; demonstration of transpiration by cobalt method; observation of Amaryllis and Gramineae type stomata - determination of the stomata size. Section II. Mineral nutrition - Chemical analysis of the plant (mineral components): determination of dry matter and percentage water content in leaves and seeds; chemical analysis of ash. - Plant chemical analysis (organic compounds): detection of sugars and proteins in plant material. Section III. Photosynthesis - Photosynthesis conditions and factors: influence of light intensity and colour on the intensity of photosynthesis, light- and shade plants. - Properties of photosynthetic pigments, detection of assimilative starch. - The role of the central metal atom in the porphyrin ring of the chlorophyll molecule, obtaining pheophytin and determining its concentration, obtaining Cu-porphyrin and determination of its properties. Section IV. Respiration - Quantitative determination of the intensity of respiration of germinated seeds using Pettenkofer's method; oxygen uptake during respiration of
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	germinated seeds. Section V. Growth and development, plant movements - Plant growth and development: determining the growth zone of the root and shoot; determination of the elongation in the growth zone of the root and shoot, determination of the elongation speed of the coleoptile using a microscope; determining the germination capacity of seeds. - Plant movements: phototropism of the coleoptile (Darwin's test); phototropism and geotropism of shoot and root; opening of stomata.
Bibliography	- Biochemistry & Molecular Biology of Plants by B.B. Buchanan, W. Gruissem, J. Wilhelm, L. Russell (eds.) - Plant Physiology by L. Taiz, E. Zeiger (eds)
Learning outcomes	KNOWLEDGE W1: The student knows and understands the physiological processes taking place at the level of the cell, organ and the whole plant, and recognizes the influence of environmental factors on the functioning of plant organisms. W2: Student knows and understands professional terms and terminology used in natural sciences and uses them together with mathematical and statistical methods to describe and interpret physiological processes. W3: Student knows and understands the relationship of plant physiology with other natural sciences, and gives examples of modification of physiological processes with the use of biotechnological tools. SKILLS U1: The student is able to apply basic research tools and techniques and conduct laboratory experiments and observations, and then interprets the results obtained to formulate appropriate conclusions. U2: The student is able to plan and organize work on his/her own and in a team and cooperate with others in order to perform specific tasks effectively. U3: The student is able to use the academic textbooks and other sources of information for independent learning of specific parts of material. SOCIAL COMPETENCE K1: The student is ready to critically assess the actions of his own and other members of the group and to take responsibility for the consequences of those actions. K2: Student is ready to improve his competences and actively acquire and update his knowledge.
Practice	-
Teaching methods	Lecture: information lecture, multimedia presentation, film, discussion, case study

	Labs: experiment, direct observation, measurement, discussion
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