

**Course name:****Plant physiology and biochemistry**

ECTS	6
Course status	<i>Facultative</i>
Course final assessment /evaluation of outcomes	<i>Exam</i>
Prerequisite	<i>Interest in plant biology and organic chemistry</i>

**Main field of study:**

The aim of the course is to explain plant life processes as a basis for yield and analyse the processes of the uptake, exchange and transformation of matter and energy as affected by various environmental factors

Educational profile	General academic
Code of studies and education level	<b>SM</b>
Semester of studies	Winter (1, 3)
Language of instructions	English

**Course offered by:**

Name of faculty offering the course	Faculty of Agriculture and Economics
Name of department offering the course	Department of Plant Physiology, Breeding and Seed Science
Course coordinator	Renata Bączek-Kwinta

**Learning outcomes:**

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
<b>KNOWLEDGE – student knows and understands</b>			
	The structure of macromolecules important for living organisms	PLAPB_K01	0522 , 0531, 0811, 0812
	Basic biochemical processes occurring in plants	PLAPB_K02	0522 , 0531
	Biochemistry of photosynthesis, respiration and nitrogen metabolism in plants	PLAPB_K03	0522 , 0531, 0811, 0812
<b>SKILLS – student is able to</b>			
	Draw and recognize the structure o basic biomolecules	PLAPB_SK01	0522, 0531
	Describe photosynthesis, respiration, nitrogen assimilation, vernalisation, verbally and using schemes and diagrams.	PLAPB_SK02	0522, 0531, 0811, 0812
	To apply the knowledge on genetic control of plant life in plant cultivation	PLAPB_SK02	0811, 0812

SOCIAL COMPETENCIES – student is ready to:			
	Perform some biochemical and physiological experiment	PLAPB _SC01	0522, 0531, 0811, 0812
	Use basic microscopic techniques for plant tissue examination	PLAPB _SC02	0522, 0811, 0812
	Find specific molecular pathway in plant molecular database	PLAPB _SC03	0522, 0531, 0811, 0812

### Teaching contents

Lectures		30 hours
Topics	<ol style="list-style-type: none"> <li>1. Molecular organisation of life: classification, structure and properties of organic compounds essential for the functioning of living organisms:               <ol style="list-style-type: none"> <li>1.1. Carbohydrates and lipids, structure of biological membranes</li> <li>1.2. Proteins and nucleic acids</li> <li>1.3. Enzymes, their function. regulation of enzyme activity</li> </ol> </li> <li>2. Water in plants               <ol style="list-style-type: none"> <li>2.1. Osmotic properties of cells, diffusion versus osmosis, mechanisms for the uptake and conduction of water</li> <li>2.2. Transpiration, plant water balance and possibility of its regulation in agricultural practice</li> </ol> </li> <li>3. Plant mineral nutrients               <ol style="list-style-type: none"> <li>3.1. The role of individual minerals, physiological mechanisms for the uptake and transport of ions</li> <li>3.2. Effect of external factors on mineral uptake, common laws governing the mineral nutrition of plants</li> </ol> </li> <li>4. Photosynthesis               <ol style="list-style-type: none"> <li>4.1. The mechanism of photosynthesis and its modifications in different plants</li> <li>4.2. Ecology of photosynthesis and assimilate translocations</li> </ol> </li> <li>5. Anabolism and catabolism of carbohydrates, proteins and fats, respiratory processes               <ol style="list-style-type: none"> <li>5.1. Utilisation and degradation of sugars – cellular respiration</li> <li>5.2. Biosynthesis and catabolism of lipids and fatty acids</li> <li>5.3. Mechanisms of regulation of metabolic processes and energy transfer</li> <li>5.4. Biosynthesis of nitrogen-containing compounds (amino acids, nucleotides, proteins, nucleic acids)</li> </ol> </li> <li>6. Plant growth and development               <ol style="list-style-type: none"> <li>6.1. Plant growth regulators</li> <li>6.2. Developmental signals, regulation of morphogenesis</li> </ol> </li> </ol>	
Accomplished learning outcomes		Exam; the grade is 67% of contribution in the final grade
Means of verification, rules and criteria of		Written test, mixed version.

assessment	Grade E (2.0) < 50% Grade D (3.0) 50% Grade C (3.5) 60% Grade B (4.0) 70% Grade B+ (4.5) 80% Grade A (5.0) 90-100%
Classes:	15 hours
	<ol style="list-style-type: none"> <li>1. Carbohydrates, lipids, amino acids, proteins : structural biochemistry – quantitative, qualitative and functional analysis</li> <li>2. Water in plants: osmotic processes, water uptake and transport, transpiration</li> <li>3. Mineral nutrients: deficiency symptoms; antagonism of ions; effects of salinity and pH of the substrate on plant growth</li> <li>4. Photosynthesis: extraction and separation of photosynthetic pigments, physical and chemical properties of chlorophyll. Identification of photosynthates in non-photosynthetic tissues, the pattern of CO<sub>2</sub> assimilation in different plant groups.</li> <li>5. Metabolism: enzymes, nucleic acids, cellular respiration.</li> <li>6. Plant growth and development: comparative analysis of plant growth; determination of plant growth zones; the impact of external factors and phytohormones on growth and development. Plant movements. Seed dormancy vernalisation, photomorphogenesis.</li> </ol>
Accomplished learning outcomes	Classes reports, tests
Means of verification, rules and criteria of assessment	<ol style="list-style-type: none"> <li>1. Grades for accomplished tasks realised individually or as a teamwork. The assessment will be based on the efficiency and organization of a team and skills in using the source materials.</li> <li>2. Correctness of tasks performance, tests.</li> </ol> <p>Classes grade is 33% of the contribution in the final grade.</p>
<b>References:</b>	
Basic	<ol style="list-style-type: none"> <li>1. Lecture notes, classes handouts</li> <li>2. Taiz L., Zeiger E. (eds) Plant Physiology. 2006, Sinauer Associates, Inc., Sunderland.</li> </ol>
Supplementary	
<b>Structure of learning outcomes</b>	
Area of academic study: R – Agricultural, forestry and veterinary sciences	6 ECTS **
Area of academic study: T – technological sciences	ECTS**

**Structure of student activity**

Contact hours	50	hrs.	2.6	ECTS**
Including:				
lectures	30	hrs.	1.2	
classes and seminars	15	hrs.	0.6	
consultations	2	hrs.	0.2	
participation in research	0	hrs.	0.2	
obligatory traineeships	0	hrs.	0.4	
participation in examination	3	hrs.	0.1	
e-learning	10	hrs.	0.4	ECTS**
student own work	130	hrs.	5.2	ECTS**

\*Areas of academic study in the fields of: H- humanities; S - social studies; P – biological sciences; T – technological sciences; M- medical, sport and health sciences; R – Agricultural, forestry and veterinary sciences; A – the arts

\*\* stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes