Course name:
MOLECULAR BACKGROUND OF CROP PRODUCTION

ECTS	3
Course status	*obligatory*
Course final assessement/evaluation of outcomes	*exam*
Prerequisites	*Basic players in molecular biology (RNA, DNA, proteins, 'The Central Dogma')*

Main field of study: Agriculture	
Profile of study	*general academic*
The code of studies (education level)	*MSc.*
Semester of studies	*summer*
Language of instruction	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*
Course coordinator	*Prof. dr hab. inż. Marcin Rapacz (rrrapacz@cyf-kr.edu.pl)*

Learning outcomes of the course:

Symbol of outcome	Description of learning outcome	main field of study outcomes	discipline
KNOWLEDGE – student knows and/or understands:			
MBCP_W01	*the molecular basis of physiological processes affecting crop yield*	*RO2_W08 RO2_W21*	*R*
MBCP_W02	*the linkage between genes and phenotypic response to the environment*	*RO2_W11*	*R*
MBCP_W03	*the way in which theory of plant molecular biology can help in practical agricultural problems*	*RO2_W08*	*R*
MBCP_W04	*the need to deepen the knowledge in the general biology of plants*	*RO2_W10*	*R*
SKILLS – student is able to:			
MBCP_U01	*analyze gene expression on mRNA level*	*RO2_U07, RO2_U08, RO2_U12,*	*R*
MBCP_U02	*collect, compile and interpret the experimental data*	*RO2_U02, RO2_U04*	*R*
MBCP_U03	*use the knowledge to explain the molecular action of different factors affecting crop yielding*	*RO2_U01, RO2_U05*	*R*

SOCIAL COMPETENCE- student is ready to:			
MBCP_K01	*organize and participate in the work of research teams designed to perform a specific experiment*	*RO2_K02*	*R*
MBCP_K01	*understand the relation between genes and common, agricultural activities*	*RO2_K07*	*R*

Teaching contents:

Lectures		*15 godz.*
Topics of the lectures	*Introduction: interactions between plant genome and environment in plant growth, development and evolution.*	
	Basic mechanisms of gene expression regulation in plants.	
	Basic signal transduction pathways in plants.	
	Perception of the environmental signals in plant cells.	
	Photosynthetic redox signaling in plants and its role in a stress response.	
	Molecular mechanism of plant hormone signals.	
	Molecular regulation of vegetative/generative transition.	
	Molecular regulations of photosynthetic activity in the response to endogenous and environmental signals.	
	Molecular regulations of plant photosynthetic productivity, the role of agrotechnical factors.	
	Cold acclimation and freezing tolerance – basic mechanism.	
	Cold acclimation and freezing tolerance – environmental effects and regulations of molecular response network.	
	Drought tolerance of crops – does it really exist?	
Accomplished learning outcomes	*MBCP_W01, MBCP_W02, MBCP_W03, MBCP_W04*	
Verification methods, rules and criteria of outcome assessment	*Written test exam, for passing an examination at least 60% of questions should be answered correctly. The contribution of the evaluation of the lectures in the final grade is 66.6%.*	

Classes		*15 godz.*
Topics of the classes	*Experiment planning and set up, method description and preparation.*	
	mRNA isolation and reverse transcription, genomic DNA elimination.	
	Quantity and quality of nucleic acids (spectrophotometric evaluation).	
	Real-time PCR reaction and data analysis.	
Accomplished learning outcomes	*MBCP_U01, MBCP_U20, MBCP_U03, MBCP_K01, MBCP_K02*	
Verification methods, rules and criteria of outcome assessment	*Evaluation of individual gene expression analysis project. For passing laboratory classes the project should be properly executed. The contribution of the evaluation of laboratory classes in the final grade is 33.4%.*	

References:

Basic	1. *Taiz L., Zaigler E. (eds.) "Plant Physiology" 4th Edition, 2006. Sinauer, Sunderland, ME.* 2. *Taiz L. et al. (eds.) "Plant Physiology and Development" 6th Edition, 2014. Sinauer, Sunderland, ME.* 3. *Ashraf M., Harris P.J.C. "Abiotic Stresses – Plant resistance through breeding and molecular approaches" 2005. FPP Press, New York.*
Supplementary	1. *Kozera B., Rapacz M. 2013. Reference genes in real-time PCR. J. Appl. Genetics 54:391-406.* 2. *Rutowicz K. et al. 2015. A specialized histone H1 variant is required for adaptive responses to complex abiotic stress and related DNA methylation in Arabidopsis. Plant Physiology 169 (3): 2080-101.* 3. *Jurczyk B., Pociecha E., Grzesiak M., Kalita K.., Rapacz M. 2016. Enhanced expression of Rubisco activase splicing variants differentially affects Rubisco activity during low-temperature treatment in Lolium perenne. J Plant Physiol 198: 49–55.*

Structure of learning outcomes:					
Discipline: R – Agricultural sciences				*3,0*	*ECTS***
Structure of student activities:					
Contact hours		*45*	*hours*	*1,8*	*ECTS***
w tym:	lectures	*15*	*hours*		
	classes and seminars	*15*	*hours*		
	consultations	*3*	*hours*		
	participation in research	*10*	*hours*		
	mandatory traineships	*0*	*hours*		
	participation in examinations	*2*	*hours*		
Student own work		*30*	*godz.*	*hours*	*ECTS***

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