

Course name:
Plant breeding

ECTS	
Course status	<i>basic, specialisation, optional, obligatory, facultativ</i>
Course final assessment /evaluation of outcomes	<i>Exam (test)</i>
Prerequisite	<i>Basic knowledge in the field of botany, genetics, plant physiology</i>

Main field of study:
AGRICULTURE

Educational profile	General academic
Code of studies and education level	SI/SM
Semester of studies	
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 Breeding, Physiology and Seed Science
Course coordinator	Tomasz Warzecha, PhD

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands			
<i>BCS_W01</i>	<i>describe basic terms, methods and effects of plant breeding</i>	<i>R2A_W03 R2A_W04</i>	<i>R</i>
<i>BCS_W02</i>	<i>Characterize germplasm applied in plant breeding (plant genetic resources, mutants, transgenic plants)</i>	<i>R2A_W04, R2A_W05</i>	<i>R</i>
<i>BCS_W03</i>	<i>possess knowledge and characterize ways of crop plant reproduction and steps of plant breeding from germplasm collecting through recombination and selection to new cultivar</i>	<i>R2A_W03 R2A_W04 R2A_W04, R2A_W05</i>	<i>R</i>
SKILLS – student is able to			
<i>BCS_U01</i>	<i>calculate frequency of genes and genotypes in autogamous and allogamous plant population</i>	<i>R2A_W03</i>	<i>R</i>
<i>BCS_U02</i>	<i>estimate breeding ability based on heredity of traits in crop plant populations</i>	<i>R2A_W04</i>	<i>R</i>
<i>BCS_U03</i>	<i>match breeding method to certain crop species considering way of reproduction way of inheritance of trait, can perform basic methods in breeding of new cultivars (isolation, emasculation, pollination)</i>	<i>R2A_W04, R2A_W05</i>	<i>R</i>
SOCIAL COMPETENCIES – student is ready to:			

<i>BCS_K01</i>	<i>understand the necessity of plant genetic resources conservation, in natural environment and generated through artificial selection as a potential germplasm for plant breeding</i>	<i>R2A_K05 R2A_K06</i>	<i>R</i>
<i>BCS_K02</i>	<i>understands the relation between genes and phenotype, plant breeding and crop production</i>	<i>RO2_K05 RO2_K07</i>	<i>R</i>

Teaching contents

Lectures 15 hours

Topics	<p>The role of plant breeding in crop production. Direction of plant breeding, achievements of crop improvements – 3 h</p> <p>Centers of plant origin, biodiversity, genetic erosion, gene banks - 2 h</p> <p>Germplasm for plant breeding, mutation and their application in plant breeding, polyploid, transgenic plants – 2 h.</p> <p>Haploid plant production, methods and advantages of DH line production in plant breeding ,application in resistance plant breeding– 2 h</p> <p>Conventional methods in plant breeding for autogamous and allogamous plants – 2 h</p> <p>Heterosis breeding (hypothesis explaining phenomenon of heterosis, examples of heterosis varieties in crop production) – 2 h</p> <p>Organization of plant breeding in Poland, plant breeding companies - 2 h</p>
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Accomplished learning outcomes *BCS_W01, BCS_W02, BCS_W03*

Means of verification, rules and criteria of 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 50%.*

Classes: 15 hours

Topics	<p>Genetic consequences of autogamous and alogamous plant reproduction – calculation of gene and genotype frequencies in autogamous and allogamous plant population. Selection and effectiveness of selection (mass and individual selection, before and after flowering, selection in diploids and autopolyploid –3 h</p> <p>The variability in plant breeding – qualitative and quantitative traits, ways of gene action, allelic and non-allelic interaction, heredity and its estimation – 2 h</p> <p>The ways of enhancing variability in plant breeding – biology of flowering of selected crops, emasculation, pollination – 2h</p> <p>Laboratory test to estimate the level or plant resistance - facultative pathogen propagation, inoculum production for lab, greenhouse and field tests purposes – media, conditions, preservation. – 2 h</p> <p>Mutagenesis, mutation breeding, gene mutation, genome mutation – prospect and limitation- 3 h</p> <p>Analysis of selected breeding method in autogamous and allogamous plant, heterosis breeding – 3 h</p>
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Accomplished learning outcomes *BCS_U01, BCS_U02, BCS_U03, BCS_K01, BCS_K02*

Means of verification, rules and criteria of assessment *Evaluation of individual project. For passing laboratory classes the project should be properly executed. The contribution of the evaluation of laboratory classes in the final grade is 50%.*

References:

Basic	<ol style="list-style-type: none"> <i>Pohelman J.M. Sleper D.A.1995. Breeding Field Crops. Iowa State University Press/Ames</i> <i>Harten A.M.1998. Mutation breeding. Theory and practical application. Cambridge University Press</i>
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	<i>Taji A., Kumar P., Lakshamanan P. 2002. In vitro plant breeding. Food Products Press</i>
Supplementary	<ol style="list-style-type: none"> 1. <i>Jacobs Th., Parlevist J.E., 1993: Durability of disease resistance, Kluwer Academic Publishers</i> 2. <i>Kang M.S. 2002. Crop improvement. Chalanges in the twenty first century. Food Product Press</i> 3. <i>Skrzypek E, Noga A., Warchol M., Czyczyło-Mysza I., Dziurka K., Marcińska I., Juzoń K., Warzecha T., Sutkowska A., Nita Z., Werwińska K. 2016. Conversion of oat (Avena sativa L.) haploid embryo into plants in relation to embryo developmental stage and regeneration media. In Vitro Cellular and Developmental Biology-Plant. 52: 590-597</i>

Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	ECTS **	3.0
Area of academic study: T – technological sciences	ECTS**	

Structure of student activity

Contact hours	30	hrs.	1.8	ECTS**
Including:				
lectures	15	hrs.		
classes and seminars	15	hrs.		
consultations	3	hrs.		
participation in research	0	hrs.		
obligatory traineeships	0	hrs.		
participation in examination	2	hrs.		
e-learning	0	hrs.	ECTS**
student own work	20	hrs.	1.2	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