

## SYLLABUS (OF A COURSE/MODULE)

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| Course/module (as specified in the approved curriculum for the field of study)<br><b>Module-4 Animal Breeding Programs</b>   |   | ECTS<br><br>8  | Catalogue<br>number   |
| Name in Polish<br><b>Planowanie i organizacja pracy hodowlanej</b>   |   |  |   |
| Unit(-s) providing the course/module (Institute/Department)<br><b>Department of Genetics and Animal Breeding (Katedra Genetyki I Podstaw Hodowli Zwierząt)</b>   |   |  |   |
| Head of course/module<br><b>Dr hab. Tomasz Strabel, prof. UP</b>   |   |  |   |
| Field of study<br><b>Animal husbandry</b>  | Level<br><b>2nd level studies</b>   | Profile<br><b>General academic</b>   | Semester<br><b>2</b>  |
| Specialisation<br><b>Animal production management<br/>(Foreign students)</b>   | MSc Specialisation<br><b>Animal production management<br/>(Foreign students)</b>  |  |   |
| <b>TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS</b><br>(organised classes/lectures and self-study)   |   |  |   |
| Type of studies: full-time   |   | Type of studies: extramural  |   |
| - lectures   | 30  | - lectures   |   |
| - Labs   | 50  | - classes  |   |
| - Other- tutored   | 30  | -  |   |
| -  |   | -  |   |
| - Self-study   | 90  | - Self-study   |   |
| Total number of hours:   |   | 200  | Total number of hours:  |
| <b>OBJECTIVE OF COURSE/MODULE</b>  |   |  |   |
| Introduction to design and optimization of animal breeding programs based on traditional and alternative strategies. Presentation of consequences of long term selection. Presentation of methods of utilizing genetic markers in animal breeding. Introduction to methods for estimating genomic and conventional breeding values; assessing breeding values accuracy. Presentation of novel traits examples and introduction to new possibilities for improving such traits utilizing genomic selection. Presentation of breeding programs for selected livestock species. The aim of the genomic part is to realize rapid development of knowledge about the molecular basis of inheritance processes and variability of traits in domestic animals as well as demonstration that advances in genomics are practical and widely used in animal breeding programs. |   |  |   |
| <b>TEACHING METHODS</b>  |   |  |   |
| Lectures – presentation with use of multimedia projectors<br>Labs – computer lab, exercises using simulation software, case studies using worksheet prepared examples, work with bioinformatic tools, exercises using microscopes.<br>Preparing and presenting of two presentations: 1. Application of genomics 2. Breeding programs or selected elements of breeding program in animal breeding.<br>Study-visit to organization or company involved in animal breeding.   |   |  |   |
| <b>LEARNING OUTCOMES</b>   |   | Reference to<br>field outcomes   | Reference to<br>area outcomes   |
| Knowledge  | E1- has advanced knowledge about programs of animals genetic improvement with special focus on verification of results and consequences.<br>E2 - has advanced knowledge about genetic inheritance and genetic variation and functioning of genome and its use in animal breeding  | Z2A_W01<br>Z2A_W02<br>Z2A_W10<br>Z2A_W16<br>InzA_W01<br>InzA_W05   | R2A_W01<br>R2A_W03<br>R2A_W04<br>R2A_W05<br>R2A_W06                       |
| Skills   | E3- can explain and understands methods of animal improvement including genomic selection.<br>E4- understands and can predict consequences of animal selection including alternative strategies of genetic improvement.<br>E5- makes decision about strategies of genetic improvement with respect to socio-economic circumstances.<br>E6 – can evaluate possibilities of implementation of diagnostic methods in animal breeding | Z2A_U01<br>Z2A_U04<br>Z2A_U06<br>Z2A_U08<br>Z2A_U10<br>Z2A_U12<br>InzA_U01<br>InzA_U02<br>InzA_U03<br>InzA_U06<br>InzA_U07<br>InzA_U08 | R2A_U01<br>R2A_U02<br>R2A_U04<br>R2A_U05<br>R2A_U06<br>R2A_U07<br>R2A_U08 |

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| Social competences  | E7- is aware of profits and negative consequences of animal breeding.<br>E8- knows how animal breeding methods can impact animal welfare. Knows how to reduce negative consequences of animal breeding.<br>E9 – understands the importance of continues education, including genetics and genomics. | Z2A_K01<br>Z2A_K02<br>Z2A_K03<br>Z2A_K05<br>Z2A_K06<br>Z2A_K08<br>Z2A_K09<br>InzA_K01 | R2A_K01<br>R2A_K03<br>R2A_K04<br>R2A_K05<br>R2A_K06<br>R2A_K07 |
| <b>Methods to verify learning outcomes</b>  |   | Outcome Reference Numbers   |  |
| Tests<br>Presentation of application of genomics in animal breeding and presentation of breeding programs or selected elements of breeding program in animal breeding.  |   | E1-E9<br>E1-E4  |  |
| <b>TEACHING CONTENT</b>   |   |   |  |
| <b>Lectures</b><br>Breeding goal definition and breeding strategy selection. Elements of animal breeding programs and methods of its optimization. Traditional and alternative programs of animal improvement, ways to explore nonadditive genetic variance. Reproduction techniques and their role in animal breeding. Marker assisted selection. Economic aspects of animal breeding. Principles of genomic selection. Relationships (pedigree vs. genomic). Estimating genomic breeding values. Accuracy of breeding values. Phenotypes in genomic selection. Novel traits. Genotype imputation. Improving the accuracy for novel traits. History of genome research; the organization of animal' s genomes; characteristic sequences; methods used in analysis of genome organization; bioinformatic analysis of the genome; functional genomics: gene expression; epigenetic mechanisms; research tools used for breeding – e.g. SNP microarrays; usage of genomics tools to identify mutations / polymorphisms responsible for the phenotypic variability of production traits and the occurrence of hereditary diseases. |   |   |  |
| <b>Other</b><br>Factors determining animal breeding strategies. Elements of animal breeding programs. Practical use of method to optimize breeding programs. Prediction of the rate of genetic improvement of alternative breeding programs. Introduction to breeding programs which exploits non-additive genetic variation. The use of reproduction techniques in animal breeding programs. Relationships (pedigree vs. genomic). Estimating genomic breeding values. Accuracy of breeding values. Genetic progress due to genomic selection. Genomics: recognition of domestic animal chromosome sets, the use of bioinformatic software for genome analyses, presentation prepared by students (based on publications in scientific journals) concerning the development of genomics in domestic animals and the usage of these achievements.   |   |   |  |
| <b>Forms and criteria for passing of course/module</b>  |   | Weights for the final grade   |  |
| To complete the module each of the elements listed below have to be completed.<br>Three tests (two for breeding programs and one for genomic selection) covering lectures and labs,<br>Test covering genomic lectures and labs.<br>Presentation - genomics<br>Presentation – animal breeding program  |   | 60%<br><br>20%<br>10%<br>10%  |  |
| <b>LIST OF LITERATURE</b>   |   |   |  |
| <b>Core literature</b>  |   |   |  |
| <ol style="list-style-type: none"> <li>1. Bourdon R.M. 2000. Understanding Animal Breeding.</li> <li>2. Douglas S. Falconer and Trudy F.C. 1996. Introduction to Quantitative Genetics</li> <li>3. Kinghorn. B.P. Van der Werf. J. and Ryan. M. 2000. Animal Breeding - Use of New Technologies.</li> <li>4. T.A Brown 2006. Genomes 3.</li> <li>5. <a href="#">Claverie J.-M. 2007.</a> Bioinformatics for Dummies.</li> </ol>   |   |   |  |
| <b>Additional sources</b>   |   |   |  |
| <ol style="list-style-type: none"> <li>1. Popular-scientific articles</li> <li>2. Scientific articles (for example: Journal of Dairy Science, Journal of Animal Science, Journal of Applied Genetics)</li> </ol>  |   |   |  |