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| **Title and Code of the subject**:Animal Genetics MTMAL7001A | **ECTS Credit Points: 4** |
| **Type** of the subject: compulsory | |
| **Ratio of theory and practice: 70/30** (credit%) | |
| **Type and number of classes per semester**: 28 hours lecture and 14 hour practice per semester | |
| **Type of exam**: practical course mark | |
| **Subject in the curriculum:** semester 1 | |
| Preliminary requirements:Principles of livestock production | |
| **Summary of content - theory**: The course is built on the Mendelian and population/quantitative gentical knowledge of the students. During this course students extend their knowledge in quantitative genetics of livestock populations bearing in mind that we work with biological organism but approach them from a mathematical point of view. The student will know how to define the breeding goal and find individuals in the population to fulfil that goal, how to mate them and predict the selection response. | |
| Course objectives: Having fulfilled the course, students will be able to apply the Mendelian, population genetics a quantitative genetic knowledge in practical situations.   1. Genetical disorders, major genes, application of major genes in selection programs 2. Genetical imprinting 3. Genotype-environment interaction 4. Breeding objectives and performance testing 5. Resembelance between relatives, inbreeding 6. Genetic parameters 7. Selection index I. 8. Selection index II. 9. Best Linear Unbased Prediction. I 10. Best Linear Unbased Prediction. II. 11. Selecting for threshold traits 12. Selection response 13. Crossing systems 14. Conservation genetics, rare breeds | |
| **Summary of content - practice**: The students will aquire the practical application skills in dealing with large and small livetock population. They will apply standard computer programs to detect similarities and dissimilarities between individuals and populations. The teacher first demonstrate the solutions then individual and group tasks will be given to improve the student’s computational and communications skills. Simulation programs and real examples will be presented. | |
| Skills to be learnt: Understand the modern genetic knowledge that is needed to design animal breeding programs; Familiar with the modern animal breeding technologies; Become committed to objective approach of animal science; Able to choose the relevant breeding strategies. Able to find literature in the topic and critically analyse it. 1. Genetic disorders, major genes, application of major genes in selection programs2. Genetic imprinting, epigenetics3. Genotype-environment interaction (GxE)4. Breeding objectives and performance testing5. Resembelance between relatives, inbreeding 6. Genetic parameters 7.-8. Selection Index 9-10. Best Linear Unbiased Prediction  11. Selecting for threshold trait  12. Selection response  13. Crossing systems  14. Conservation genetics, rare breeds | |
| **Literature, handbooks in English** | |
| 1. Falconer, D.S. 2017. Introduction to Quantitative Genetics. 4th ed. Longman Scientific and Technical. ISBN-13: 978-0582243026 2. Mrode, R.A. 2005. Linear Models for the Prediction of Animal Breeding Experiments. CAB International. ISBN 0851990002 3. Lynch, M., Walsh, B. 1998.Genetics and Analysis of Quantitative Traits. Sinauer Associates. ISBN 978-0878934812 4. Kaps, M., Lamberson, W. ( 2009) Biostatistics for Animal Science. An introductory text. 2nd ed. CABI. ISBN 978-1-84593-540 5 | |
| **Competencies gained** *(acc. to the Regulation on training and outcome requirements)* | |
| 1. **Knowledge:**   The Student knows the modern genetic background that are necessary to design an up-to date breeding technology.   1. **Skills:**   The Student will be able to perform research and innovation tasks, furthermore, to coordinate and organise advisory service for animal breeding organisations. The Student will be able to participate in agricultural and natural science research connected to livestock breeding. The Student will be able to design and analyse breeding programs.  **c)** **Attitude:**  The Student is responsive for the application of methods in sustainable biodiversity. The Student considers the different requirements of species, breeds a breeders.  **d) Autonomy and responsibility:**  The Student can independently select the suitable breed improvement technology. The Student is aware of the responsibility for the safety of the animals bred by her/his contribution. | |

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| **Responsible lecturer: Dr. Komlósi István, university professor DSc** |
| **Other lecturer(s): Dr. Posta János, senior lecturer, PhD** |

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| **Terms of course completion:** |
| 1. Completing assignments / exercises 2. The presence on 2/3-rd of the classes. 3. Active participation in group discussion. |
| **Form of examination:** |
| Monitoring the progress, mid-term paper, final practical mark. |
| **Requirement(s) to get signature:** |
| Completing the independent tasks |

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| **Exam questions:** |
| 1. Please list the major genetic disorders of domestic animals. 2. What are the characteristics of the major genes? What type of selection can be implemented on major genes? Please list the important major genes. 3. What are the main effects in epigenetics? 4. How can you explain the genetic imprinting, please give examples. 5. Where can we detect genotype-environment interaction in animal breeding? 6. What are the elements of a breeding programs for different purpose of breeding? 7. How can you calculate the resemblance between relatives and where can we apply it? 8. How can you calculate genetic covariance and where can you apply it? 9. Calculation of environmental covariance and its application. 10. Calculation of pheno- geno- and environmental correlation by breeding software. 11. Breeding value evaluation by breeding software. 12. Individual, within family, between family and combined selection in different species. 13. Application of marker selection in livestock breeding. 14. Selection for threshold traits through examples. 15. Selection in small and large population. 16. What are the elements of a breeding program? |