

**SYLLABUS**  
**OF A COURSE/MODULE**

Course/module (as specified in the approved curriculum for the field of study) <b>Preventive Veterinary Medicine – Module 7</b>		ECTS <b>8</b>	Catalogue number
Name in Polish <b>Profilaktyka weterynaryjna – Moduł 7</b>			
Unit(-s) providing the course/module (Institute/Department) <b>Department of Genetics and Animal Breeding</b>			
Head of the course/module <b>Prof. dr hab. Dorota Cieślak</b> (from 2017/2018; <a href="mailto:dorota.cieslak@up.poznan.pl">dorota.cieslak@up.poznan.pl</a> )			
Field of study <b>Animal husbandry</b>	Level <b>2nd level studies</b>	Profile <b>General academic</b>	Semester <b>3</b>
Specialisation <b>Animal production management</b>	MSc Specialisation <b>Animal production management</b>		
<b>TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS</b> (tutored activities and individual work)			
Type of studies: full-time		Type of studies: extramural	
lectures	<b>45</b>	lectures	
Classes (lab, farm visit)	<b>80</b>	classes	
Other (contact with tutors)	30	Other tutored (e.g. farm visits)	
Student`s individual work	50	Student`s individual work	
Total number of hours:		205	Total number of hours:
<b>AIM AND OBJECTIVE OF THE COURSE/MODULE</b>			
to acknowledge students with the current problems in veterinary prevention with a special focus on genetic and laboratory diagnostics, backgrounds of animal fertility and well as reproductive biotechnology in farm animals. After completion of the Module students should understand the bases of cooperation between veterinarian and animal production manager in solving the most important health problems of animals and to be able to use the newest technologies implemented into health management of animals			
<b>TEACHING METHODS</b>			
Lectures – presentation with use of multimedia projectors Labs – computer lab, molecular lab Practical classes – visits to animal farms and to veterinary diagnostic labs			
<b>LEARNING OUTCOMES</b>		Reference to field outcomes	Reference to area outcomes
Knowledge	E1-has extended knowledge on organization and functioning of the genome and of genetic diagnostics applied to animal breeding;	Z2A_W01	R2A_W01
	E2-has extended knowledge on laboratory research applied to livestock breeding and in production, processing and marketing of products of animal origin;	Z2A_W03, Z2A_W06	R2A_W03 R2A_W04
	E3-has extended knowledge on animal reproduction, including novel diagnostic techniques and methods:	Z2A_W08 Z2A_W09	R2A_W05 R2A_W06
	E4-has advanced knowledge on physiology of selected species appropriate for chosen scope of the study (specialty/specialization);	Z2A_W11 Z2A_W16	
	E5-knows multifaceted conditions of animal nutrition and its influence on the environment and animal welfare; including knowledge on novel technologies and techniques of animal nutrition sufficient to the chosen scope of the study (specialty/specialization);	InzA_W01 InzA_W02	
	E6-has extended knowledge on animal-environment interaction with special consideration of consequences for ecosystems and on developing and maintaining biodiversity of the natural environment;	InzA_W05	
	E7-has expertise relevant to the chosen field of study (specialty/specialization)		

Skills	<p>E8- the student finds, confronts, critically analyses and creatively processes various forms of information, in order to solve a specific problem or practical task in the field of study and specialization;</p> <p>E9-is able to present self-developed materials, its position and views through various forms of communication;</p> <p>E10-selects and uses modern information technologies in the analysis, interpretation and presentation of results;</p> <p>E11-plans and implements research tasks, project or scientific experiment in the field of animal husbandry, formulating the correct conclusions</p> <p>E12-has knowledge on the application of knowledge of genetics and on the possibilities of genetic diagnostics in the breeding practice</p> <p>E13 - is able to apply modern techniques and technologies in farming and animal breeding</p> <p>E14-suggests solutions involving genetic, environmental and technological factors enabling increased efficiency and welfare in animal breeding and improving the quality of products of animal origin</p> <p>E15-has language skills in line with the requirements for the level of B2+, with particular emphasis on vocabulary in the field of animal husbandry</p>	<p>Z2A_U01 Z2A_U02 Z2A_U03 Z2A_U04 Z2A_U06 Z2A_U07 Z2A_U10 Z2A_U14 InzA_U01 InzA_U03 InzA_U06 InzA_U07 InzA_U08</p>	<p>R2A_U01 R2A_U02 R2A_U03 R2A_U04 R2A_U05 R2A_U06 R2A_U07 R2A_U10</p>
Social competences	<p>E16-is aware of the need to learn throughout their lives and adapt to the needs of a competitive labour market, and can inspire such actions;</p> <p>E17-is able to competently participate in the discussion and determine priorities for the common solution to the problem;</p> <p>E18-is able to manage human resources and work independently and in the team over the ensuing problem;</p> <p>E19-recognizes and resolves the fundamental dilemmas associated with farming, breeding and use of animals</p>	<p>Z2A_K01 Z2A_K03 Z2A_K04 Z2A_K05 InzA_K01</p>	<p>R2A_K01 R2A_K03 R2A_K04</p>
<b>Methods to verify learning outcomes</b>		<p style="text-align: center;">Written tests Participation in the classes Oral presentations</p> <p style="text-align: center;">Outcome Reference Numbers E1, E2, E3, E7, E8-E15 E1-E19 E9, E10, E15</p>	

## TEACHING CONTENT

### Lectures:

1. Embryology (8h): Introduction to embryology. Principles and processes of development; Principles of teratology. Developmental anomalies; Early development; Cleavage: type of cleavage in vertebrates; Gastrulation in vertebrates; Development of extracellular membranes; Implantation and placentation; Development of primary organs: notochord, neural plate and somites
2. Genetic diagnostics in animal breeding (16h): Cytogenetic diagnostics – techniques used in cytogenetic diagnostics: preparation of cytogenetic slides, chromosome banding, fluorescent in situ hybridization (FISH); Cytogenetic diagnostic – genome mutations and congenital malformations, including disorders of sex development; structural chromosome rearrangements and their impact on fertility; Molecular diagnostics – point mutations and their molecular effects, DNA polymorphism; genome wide association study (GWAS) in searching for causative mutations; Molecular diagnostics – molecular techniques: DNA isolation, PCR, DNA electrophoresis, DNA sequencing, SNP microarray; parentage testing with the use of microsatellite markers; Molecular diagnostics – molecular diagnosis of disorders of sex development; molecular diagnosis of hereditary diseases and congenital malformations; molecular detection of gene variants influencing on production traits
3. Reproductive biotechnology in farm animals (9h): The oocyte - oogenesis, evaluation of COC morphology, BCB test, in vitro maturation, ovum pick-up (OPU); The sperm cell - spermatogenesis, evaluation of sperm quality, sperm sorting by flow cytometry; CASA, artificial insemination; The embryo - development of preimplantation embryos, evaluation of embryo morphology according to IECS, in vitro embryo production, embryo transfer (ET), ICSI
4. Pathology of reproduction (2h) uterine torsion , uterine prolapse, retained fetal membranes -RFM, endometritis, metritis, pyometra, vaginal diseases, infectious diseases, delayed ovulation, ovarian cysts, embryo death , anoestrus type I,II,III,IV, abortions
5. Ultrasound diagnostics (2h) the basic characteristics of ultrasound, the analogue – to – digital data conversion chain, USG application in animal production, the traits of USG display – artefacts and their background
6. Veterinary prevention and emergency assistance (4h): principles of biosecurity, developing a biosecurity program, handling disease outbreaks, prevention of hypocalcemia, prevention of hypomagnesemia, prevention of hypokalemia, basic knowledge about vaccination, prevention of mastitis, prevention of hoof disease, calving assistance.
7. Basics of veterinary diagnostics with elements of parasitology (coccidiosis diagnostics) (4h): veterinary prevention with a special focus on coccidiosis and necrotic enteritis, backgrounds of the animals' gastrointestinal tract health and intestinal integrity, as well as microbiota composition in terms of monogastric farm animals with a special emphasis on broiler chickens.

### Lab classes

1. Embryology (12h): Light and electron microscopy technique used during the embryonic studies. Embryonic and foetal period in mammals. Embryonic period in birds. Description of external morphological features of embryos and fetuses. Determination of developmental stages; Embryology of endodermal organs. Development of the tongue, palate, stomach. The development of the small intestine (duodenum, jejunum, ileum) and large intestine (cecum, colon, rectum). The development of the gastrointestinal tract glands: liver and pancreas; Embryology of mesodermal organs. Development of the urinary tract (pronephros, mesonephros, metanephros, bladder, urethra). The development of the reproductive system (gonads, oviducts, vas deferens, external genitalia); Embryonic and fetal period in mammals. Embryonic period in birds. Description of external morphological features of embryos and fetuses. Determination of developmental stages.
2. Genetic diagnostics in animal breeding (14 h): Preparation of chromosome slides, microscopic identification of sex chromosomes, detection of sex chromosome (XX/XY) chimerism in freemartins; DNA isolation, qualitative and quantitative analysis of DNA isolates; PCR reaction and analysis of transcript levels by real-time PCR; Detection of mutations in DNA by RFLP and Sanger sequencing; Parentage control with the use of STR polymorphism
3. Reproductive biotechnology in farm animals (15h): The oocyte - COC collection and quality evaluation, BCB test, in vitro maturation; The sperm cell - evaluation of sperm quality (eozine+nigrosine staining), CASA; The embryo - in vitro fertilization, evaluation of embryo morphology;
4. USG diagnostics (8h) The analogue – to – digital signal conversion, digital data compression and storage, the pre-processing methods of a digital image, acquisition and analysis of scientific images (USG, MRI, CT, confocal microscopy, gels, etc.)
5. Veterinary prevention and emergency assistance (6h): interpretation of results from laboratory examinations (bacteriological examinations, serological examinations, PCR examinations).

**Practical classes (visits on farm and commercial laboratories)**

1. Reproductive biotechnology in farm animals (8h) presentation of two procedures in cattle: ovum-pick up (OPU) and embryo transfer (ET)
2. Pathology of reproduction (8h) diagnostics of pregnancy; causes of reproductive failures; Basics of imaging diagnostics
3. Basics of veterinary diagnostics with elements of parasitology (coccidiosis diagnostics) (9h) Avian coccidiosis; Necrotic enteritis; McMaster technique, working with light microscope, proceedings with animal tissue/faecal samples.

**Forms and criteria for passing the course/module**

written tests - 3 courses (genetic diagnostics, embryology, reproductive biotechnology)  
oral presentations – 4 courses (USG, veterinary prevention, veterinary diagnostics, pathology of reproduction)

**Weights for the final grade**

60%  
40%

**LIST OF LITERATURE**

1. Arczewska-Włosek A., Świątkiewicz S. (2015). The efficacy of selected feed additives in the prevention of broiler chicken coccidiosis under natural exposure to *Eimeria* spp. *Annals of Animal Science*. 15: 725-735
2. DesCoteaux L, Colloton J, Gnemmi G. (2009) *Practical Atlas Of Ruminant and Camelid Reproductive Ultrasonography*. ISBN: 978-0-8138-1551-0; Wiley-Blackwell
3. Ewing W.N., Tucker L.A. (2008). *The living GUT*. 2<sup>nd</sup> edition. Nottingham University Press. Nottingham, United Kingdom.
4. Hartig SM (2013) Basic image analysis and manipulation in ImageJ. *Current Protocols in Molecular Biology* 14,122
5. Hsu W. *Handbook of veterinary pharmacology*. Wiley-Blackwell 2008
6. Józefiak D., Kierończyk B., Rawski M., Hejdysz M., Rutkowski A., Engberg R.M., Hojberg O. (2014). *Clostridium perfringens* challenge and dietary fat type affect broiler chicken performance and fermentation in the gastrointestinal tract. DOI: 10.1017/S1751731114000536
7. Józefiak D., Świątkiewicz S., Kierończyk B., Rawski M., Długosz J., Engberg R.M., Hojberg O. (2016). *Clostridium perfringens* challenge and dietary fat type modifies performance, microbiota composition and histomorphology of the broiler chicken gastrointestinal tract. *Archiv fur Geflugelkunde*. DOI: 10.1399/eps.2016.XX
8. Lechniak D, E. Pers-Kamczyc, P. Pawlak (2008) Timing of the first zygotic cleavage as a marker of developmental potential of mammalian embryos in vitro. *Reproductive Biology* 8(1): 23-42
9. McGeady T.A. (2005) "Veterinary Embryology" ISBN-13: 978-1405111478 Blackwell Publishing
10. Orsztynowicz M, Pawlak P, Podstawski Z, Nizanski W, Partyka A, Gotowiecka M, Kosiniak-Kamysz K, Lechniak D. (2016) Mitochondrial DNA Copy Number in Spermatozoa of Fertile Stallions. *Reprod Domest Anim*. 51(3):378-385.
11. Pawlak P, Cieslak A, Warzych E, Zejden Z, Szumacher-Strabel M, Molinska-Glura M, Lechniak D. (2012) No single way to explain cytoplasmic maturation of oocytes from prepubertal and cyclic gilts. *Theriogenology* 78(9):2020-2030.
12. Pereckienė A., Kaziūnaitė V., Vyšniauskas A., Petkevičius S., Malakauskas A., Šarkūnas M., Taylor M. A. (2007). A comparison of modifications of the McMaster method for the enumeration of *Ascaris suum* eggs in pig faecal samples. *Veterinary parasitology*, 149(1), 111-116.
13. Perkel KJ, Tscherner A, Merrill C, Lamarre J, Madan P (2015) The ART of selecting the best embryo: A review of early embryonic mortality and bovine embryo viability assessment methods. *Mol Reprod Dev* 82(11):822-38
14. Petrunkina AM, Waberski D, Günzel-Apel AR, Töpfer-Petersen E. (2007) Determinants of sperm quality and fertility in domestic species. *Reproduction* 134(1):3-17.
15. Schindelin J, Arganda-Carreras I, Frise E, Kaynig V, Longair M., Pietzsch T, Cardona A (2012) Fiji - an Open Source platform for biological image analysis. *Nature Methods*, 9(7), 10.1038/nmeth.2019.
16. Smith Thomas H (2009) *The Cattle Health Handbook: Preventive Care, Disease Treatments & Emergency Proc.* Heather Smith Thomas (1672) ASIN: B01FOD4NZ0
17. Szczerbal I., Switonski M. (2016). Chromosome Abnormalities in Domestic Animals as Causes of Disorders of Sex Development or Impaired Fertility, Chapter 9 (pages 207-225), in: *Insights from Animal Reproduction* (Ed. R. Payan-Careira), InTech, Rijeka, Croatia. <http://www.intechopen.com/books/insights-from-animal-reproduction>