STUDY PLAN

University of Debrecen
DOCTORAL SCHOOL OF ANIMAL SCIENCE

The fields and ranges of credits per semester

Description	Number of semester								In total
	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	
Study, subjects	3-6	6-9	4-7	0-3	0	0	0	0	**16**
Research	19-27	16-24	18-26	22-30	30	30	30	30	**184-224**
Teaching	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	**0-40**
In total:	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**240**

The minimum number of academic credits to be obtained during the period of study: 16
The total number of credits to be obtained during the entire training program: 240

The list of compulsory and optional subjects

Compulsory subjects:

Subject code	*Subject name*	*Course instructor*	*Credit*	*1. semester (autumn)*	*2. semester (spring)*	*3. semester (autumn)*	*4. semester (spring)*
MT-ALL-A001	**Design and analysis of animal breeding experiments I.**	Dr. Komlósi István	2	X			
MT-ALL-A002	**Design and analysis of animal breeding experiments II.**	Dr. Komlósi István	2		X		
MT-ALL-A07	**Informatics**	Dr. Lengyel Péter József	1	X			
MT-ALL-A21	**Statistics**	Dr. Balogh Péter	1		X		
MT-ALL-A005	**Animal breeding I.**	Dr. Mihók Sándor	2		X		
MT-ALL-A006	**Animal breeding II.**	Dr. Mihók Sándor	2			X	
MT-ALL-A27	**Writing Scientific Papers**	Dr. Posta János	2	X			
DEAKIDI	**General Research Methods**	Scientific directorate	1		X		
AT-KV	**Complex exam**	Dr. Pepó Péter	0				X

Optional subjects:

Subject code	*Subject name*	*Course instructor*	*Credit*	*1. semester (autumn)*	*2. semester (spring)*	*3. semester (autumn)*	*4. semester (spring)*
MT-ALL-C19-K1	**Research Methods on Evaluation of Grasslands and Grassland Productivity**	Dr. Nagy Géza	1		X		
MT-ALL-C20-K1	**Scientific evaluation of grassland feed products**	Dr. Nagy Géza	1		X		

Subject code	*Subject name*	*Course instructor*	*Credit*	*1. semester (autumn)*	*2. semester (spring)*	*3. semester (autumn)*	*4. semester (spring)*
	and utilization of grassland						
MT-ALL-C21-K1	**Aquaculture**	Dr. Bársony Péter	1	X			
MT-ALL-B18	**Animal health**	Dr. Pálfyné Dr. Vass Nóra	1			X	
MT-ALL-C34-K1	**Animal species identification by molecular biology tools**	Dr. Czeglédi Levente	1			X	
MT-ALL-C17-K1	**Physiological properties of animal derived food products**	Dr. Csiki Zoltán	1	X			
MT-ALL-C18-K1	**Possibilities in improvement of functional food of animal origin**	Dr. Csiki Zoltán	1	X			
MT-ALL-C38-K1	**Products and co-products of animal production in circular agriculture**	Dr. Nagy Attila	1			X	
MT-ALL-B24	**Policy of Livestock production**	Dr. Jávor András	1				X
MT-ALL-C30-K1	**Biochemistry of animal-origin food production**	Dr. Csapó János	1	X			
MT-ALL-C29-K1	**Genetic and molecular biology basics of nutrition research based on animal model systems**	Dr. Máthé Endre	1			X	
MT-ALL-C36-K1	**Poultry breeding**	Dr. Mihók Sándor	1	X			
MT-ALL-C12	**Biotechnology**	Dr. Pálfyné Dr. Vass Nóra	1				X
MT-ALL-B25	**Development of living space**	Dr. Szendrei László	1				X
MT-ALL-C35-K1	**Separation techniques in animal derived food analysis**	Dr. Csapó János	1			X	
MT-ALL-C39-K1	**Embriology**	Dr. Macháty Zoltán	1			X	
MT-ALL-B12	**Forest and Game Management Policy**	Dr. Rédei Károly	1				X
MT-ALL-B20	**Ethology**	Novotniné Dr. Dankó Gabriella	1			X	
MT-ALL-C16-K1	**Species protection and ecosystem regulation**	Dr. Penksza Károly	1		X		
MT-ALL-B35-K1	**Sustainable animal keeping systems and technologies**	Dr. Béri Béla	1		X		
MT-ALL-C008	**Genetics and selection**	Dr. Komlósi István	1	X			
MT-ALL-B13	**Gene conservation**	Dr. Mihók Sándor	1		X		
MT-ALL-C22-K1	**Fish farming**	Dr. Stündl László	1	X			
MT-ALL-C015	**Fish ecology and protection**	Dr. Juhász Lajos	1				X
MT-ALL-C32-K1	**Hidrobiology**	Dr. Nagy Sándor Alex	1	X			

Subject code	*Subject name*	*Course instructor*	*Credit*	*1. semester (autumn)*	*2. semester (spring)*	*3. semester (autumn)*	*4. semester (spring)*
MT-ALL-C020	**Intensive fisch culture**	Dr. Váradi László	1			X	
MT-ALL-C23-K1	**Sheep breeding**	Dr. Jávor András	1	X			
MT-ALL-C24-K1	**Horse breeding**	Dr. Mihók Sándor	1	X			
MT-ALL-C051	**Bee biology**	Dr. Sárospataki Miklós	1	X			
MT-ALL-C25-K1	**Beekeeping**	Dr. Oláh János	1		X		
MT-ALL-C06	**Microbiology**	Dr. Peles Ferenc Árpád	1			X	
MT-ALL-B05	**Molecular genetics**	Dr. Kusza Szilvia	1	X			
MT-ALL-C053	**Ecology, biological conservation and animal welfare**	Dr. Németh Attila	1			X	
MT-ALL-C028	**Breeding of endangered breeds**	Dr. Mihók Sándor	1			X	
MT-ALL-C26-K1	**Precision animal nutrition**	Dr. Szabó Csaba	1		X		
MT-ALL-C37-K1	**Proteomics in animal production**	Dr. Czeglédi Levente	1			X	
MT-ALL-C27-K1	**Pig breeding**	Novotniné Dr. Dankó Gabriella	1	X			
MT-ALL-C003	**Reproduction biology**	Dr. Rátky József	1				X
MT-ALL-C33-K1	**Cattle breeding**	Dr. Béri Béla	1	X			
MT-ALL-C28-K1	**Feed evaluation and production technology**	Dr. Szabó Csaba	1			X	
MT-ALL-C31-K1	**Milk and dairy products as functional food**	Dr. Csapó János	1				X
MT-ALL-C13	**Milk processing**	Dr. Csanádi József	1				X
MT-ALL-C07	**Economy of milk production**	Dr. Rózsáné Dr. Várszegi Zsófia	1			X	
MT-ALL-B37-K1	**Population dynamics of wild animals**	Dr. Németh Attila	1	X			
MT-ALL-C052	**Conservation of the diversity of wild populations**	Dr. Németh Attila	1		X		
MT-ALL-C045	**Game ecology and protection**	Dr. Juhász Lajos	1				X
MT-ALL-C14	**Evaluation of carcass and meat**	Dr. Jávor András	1				X
MT-ALL-B34	**Health of aquatic animals**	Dr. Jeney Zsigmond	1				X

The descriptions and requirements of the subjects

COMPULSORY SUBJECTS			
Name of the subject	**Course instructor**	**The description of the subjects**	**Requirements**
Design and analysis of animal breeding experiments I.	Dr. Komlósi István	Description of observations and experiments based on scientific publications. The objective of the experiment. Experimental units, treatments. Determination of the experimental sample size. Sampling. Experimental error and its control. Consequences of systematic errors. Replication and its importance. Factors influencing replication. Relative accuracy in the case of a small number of treatments. Continuous distributions (normal, exponential, gamma) and discrete distributions (binomial, Poisson). Experimental designs: single-factor complete design, randomized block design, Latin square design, single-factor incomplete design.	Colloquium
Design and analysis of animal breeding experiments II.	Dr. Komlósi István	Multifactorial experiments. Factorial and hierarchical designs. Introduction to the SPSS program, introduction to the SAS program. Comparison of two means. Comparison of multiple means (LSD, Scheffé, Tukey). Evaluation of factorial experiments (fixed and random models). Evaluation of hierarchical designs. Covariance analysis. Analysis of the frequency distribution of qualitative variables. Comparison of empirical and theoretical frequency distributions with two and with more than two classes. Comparison of two empirical frequency distributions with two and with more than two classes. Comparison of more than two empirical frequency distributions. Multivariate analyses of relationships. MANOVA. Discriminant analysis.	Colloquium
Informatics	Dr. Lengyel Péter József	The general aim of teaching this course is to familiarize students with the structure, types, and functions of information systems. An additional important aspect is the processing and analysis of data from different sources, which students will learn through the use of Power BI. Fundamentals of information technologies and information systems Comparison of OLTP and OLAP systems Steps of the ETL process: extraction, transformation, loading Decision support systems and their applications Power BI: introduction and environment overview Data types, attributes, formats, IDs, keys, and table models Main data modeling techniques: fact tables and dimension tables Data integration from multiple sources, managing database connections Joins and filtering directions in the data model Report creation with visualizations: maps, cartograms, KPIs, gauges, cards, pie and column charts Built-in and custom visualizations in Power BI Filtering options and the interactions between visualizations Development of interactive dashboards and analytical possibilities Data modeling and report preparation based on a database related to a PhD research topic	Colloquium
Statistics	Dr. Balogh Péter	he system of basic statistical concepts Relationships among basic statistical concepts Statistical population and variable Statistical series and tables Fundamental methods of statistical analysis Graphical representation of statistical data and series	Within the framework of an SPSS course, students process the basic statistical methods indicated in the course syllabus, and prepare an independent

COMPULSORY SUBJECTS			
Name of the subject	**Course instructor**	**The description of the subjects**	**Requirements**
		Classification and calculation of statistical ratios Measures of central tendency Variation (dispersion) Handling of extreme values Statistical sampling Fundamentals of sampling Random sampling methods Systematic selection Non-random sampling methods Some practical problems of sampling Statistical estimation General principles of estimation Estimation based on a simple random sample Estimation based on a stratified random sample Statistical hypothesis testing Interpretation of the problem Steps of hypothesis testing Statistical tests Analysis of variance (ANOVA) Bivariate stochastic relationships Nature of relationships Association, rank correlation, and mixed relationships Calculation of correlation and regression between two quantitative variables Measurement of linear regression and correlation Non-linear bivariate regression relationships Measurement of relationship strength (calculation of correlation) in bivariate relationships Multiple linear regression and correlation analysis The problem of multicollinearity Time series analysis Significance of time series analysis and requirements for databases Components of time series Forecasting based on time series data: smoothing methods Statistical analysis of multivariate problems Principal component analysis, factor analysis, cluster analysis	case study of scientific article quality applying a statistical method considered important for their research work, using the SPSS software package. The requirements for course completion are attendance at the lectures and the preparation of an independent case study of scientific article quality, which must be defended orally at a prearranged time.
Animal breeding I.	Dr. Mihók Sándor	Students have already encountered the basic concepts of animal breeding at different levels of study, and have even been examined (on randomly chosen topics), but almost half a decade usually passes before they begin their PhD studies. Practical experience shows that updating the knowledge acquired during undergraduate studies is essential, and due to the student's greater maturity, the interpretation of this knowledge is experienced differently. Students without an agricultural background (who are sometimes in the majority) would find themselves in an academic vacuum during their training if they did not become acquainted with these concepts, their interpretations, and their applicability. Beyond all this, the aim of the subject is to familiarize students with "theoretical" animal breeding concepts through "real-life" animal husbandry. It also aims to highlight how the practical results of animal breeding (in the broadest sense of yields), in the context of modern technologies, should be used to interpret or reinterpret the concepts that form the basis of animal breeding. **The origin and domestication of farm animals** (Monophyletic origin, polyphyletic origin, ancestors of farm animal breeds, the ratio of domestic species to existing animal species, centers of domestication, the impact of domestication on living organisms, consequences of domestication and mutation, dedomestication). Application of archaeological and molecular genetic methods to the origin and domestication of domestic animals (see, for example, the tarpan–Przewalski debate and its resolution using molecular genetic methods; or archaeological research concerning the origin of Hungarian Grey cattle). **Inheritance of qualitative and quantitative traits** Boundaries and interpretation between qualitative and	Colloquium

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		quantitative traits. See, for example, coat color, which due to its polygenic nature raises classification questions. Mutation (e.g., discussed in detail through the emergence and persistence of dwarf horses, dwarf cattle, dwarf pigs). Dominance–recessivity, epistasis–hypostasis, with practical examples such as the inheritance of horse coat colors. The role of primary and secondary sex characteristics in inheritance, and the significance of castration with respect to work use, housing technologies, and meat quality. **Unity of the animal body and the environment** (Growth, development, metabolism, nutrition, adaptation, thermoregulation, comfort zone, maturity, atrophy, forced rearing, mature body weight, humidity, light, temperature, acclimatization, relationships between age and body type). Detailed discussion of breed characteristics, breed standards, housing technologies, and even precision livestock farming in the context of climate change. **Animal evaluation and formalism** (The purpose of animal evaluation, requirements for evaluators, the nature of evaluation activity, types and methods of evaluation. Relationship between evaluation results and performance improvement, e.g., the link between increased milk yield in Holstein Friesian cattle and the spread of evaluation systems. The definition, nature, and interpretation of formalism. For example: Is the horn of cattle, or its shape, formalism? Is treating crow eyes as a selection criterion formalism? Is considering horse markings as formalism or not?) **Constitution** Definition and types of constitutions based on the quality of organs and tissues, based on metabolism, and based on the nervous system (temperament). The significance and influencing factors of constitution. For example, what accounts for the exceptional performance of Belgian carrier pigeons or English racehorses? What contributes to the longevity of certain animals and humans? **The concept of species and breed** Significance and interpretation, origin, change, extinction. Classification and evaluation of breeds. The emergence of breeds, the economic importance of early- and late-maturing breeds. Factors influencing breed change. The concepts and significance of breed purity, thoroughbreds, high-percentage crossbreds, crossbreds, local breeds, and types. In what historical periods, with what population sizes, genetic diversity, and breeding policies can these concepts be meaningfully interpreted? The interpretation of breeds from the perspectives of animal breeding and legislation. **Reproduction of farm animals** Interpretation of reproduction and breeding. Characteristics of reproduction in vaginal- and uterine-type animals. Mating methods and their changes across different eras of animal breeding. Sex ratios under different mating methods. Incubation and gestation periods by species. Comprehensive interpretation of sexual maturity and breeding maturity. The role of age and societal development in reproduction and breeding. Embryo transfer, intracytoplasmic sperm injection, etc. **Value-determining traits of farm animals** Primary and secondary value traits. Heritability. Heritability estimates of different value traits and their importance. The genetic basis, explanation, and occurrence of genetic disorders in different species (see, for example, the numerous inherited defects in cattle and horse breeds). Their “management” in practical animal breeding. How does everyday animal husbandry relate to this? Estimation of breeding value based on molecular genetic markers. Evaluation of the BLUP model for breeding value estimation. Interpretation and evaluation of these aspects from the perspective of genetic progress.	

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Name of the subject	**Course instructor**	**The description of the subjects**	**Requirements**
		Selection (breeding choice) Characterization and evaluation of selection procedures based on the source of information, direction of selection, correlations among value traits, number of traits selected simultaneously, and selection indices. The relationship between selection pressure, selection response, and selection differential, and their impact on breeding efficiency. The principles of mating, and how selection influences production. For example, from 1,000 roosters, only 1 remains in the maintenance of laying-hen lines; from 1,000 bulls, 10 may become "international favorites." How does this affect genetic diversity? How can it even eliminate populations, e.g., in small breeds? **Breeding methods** Breeding towards homogeneity (purebreeding): interpretation and description. Inbreeding, linebreeding (genealogical, genetic, bloodline), family breeding, outcrossing—definitions and characterization. Interpreted in terms of different species, genetic diversity preservation, and conservation of historical breeds. Breeding towards heterogeneity (crossbreeding): interpretation and description. Grading-up, breed-improving crossbreeding—how breeders incorporate this into purebreeding programs or market adaptation. Breed-converting crossbreeding and its use in breed reconstruction. The time requirements and market pressures of new breed development, interpretation and significance of synthetic breeds. How do these adapt to climate change (see synthetic cattle breeds in Africa and South America)? The "Euro sport horse" as a currently developing synthetic breed, achieving sports performance unimaginable three decades ago. Species hybrid production and hybridization (millions of mules in Spain today; the Barbarie duck as the basis of a special hybrid-based poultry production branch).	
Animal breeding II.	Dr. Mihók Sándor	**Course objective:** The aim of the course is for the future generation of animal scientists earning a scientific degree to become acquainted with the professional work of their predecessors and the outstanding personalities who contributed to the continuous development of the field. Students should understand that their own research is indirectly built upon the achievements of former great figures in the profession. Not least, the purpose is to further develop their general professional knowledge in this area as well. Above all, students should learn to evaluate the present as a consequence of the past: the performance behind the names reflects contributions to the science of animal breeding, highlighting the significance of individuals and, as future researchers, their own personal responsibility. For those without an agricultural background, the focus should primarily be on outstanding figures in their own field of expertise. **The universal history of animal breeding, ancient animal breeding cultures.** The beginnings of breed development, famous breeding centers in Europe. The emergence of herd books and stud books in Europe. Historical phases of Hungarian animal breeding. The development of herd-booking and the establishment of breeding organizations. The foundation of performance testing, performance testing stations, and scientific institutions. Famous Hungarian breeding regions by historical periods. Prominent personalities of Hungarian animal breeding in the Reform Era and the impact of their professional work on the development of animal breeding (both practice and science). Prominent personalities of Hungarian animal breeding in the 20th century and the impact of their professional work	Colloquium

COMPULSORY SUBJECTS			
Name of the subject	**Course instructor**	**The description of the subjects**	**Requirements**
		on the development of animal breeding (both practice and science).	
Writing Scientific Papers	Dr. Posta János	The course includes knowledge of information sources, their management, information storage, basic library skills, library use, information retrieval, information processing and analysis, the structure of scientific publications, preparation of posters, short and long presentations, making demonstrations, writing summaries and publications. Defining a research objective. Introduction to and use of information sources. Library skills Internet search skills, information storage Methodology of reading scientific publications Summarizing publications Presenting publication abstracts Presenting publication abstracts Communication Communication Compiling a bibliography Preparing a PowerPoint presentation PowerPoint presentation PowerPoint presentation	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
Research Methods on Evaluation of Grasslands and Grassland Productivity	Dr. Nagy Géza	The research methodology course outlines, from a systems perspective, the aspects that are significant in the evaluation of grasslands and in the study of grassland yield development according to the current state of science. With the help of an international handbook, it reviews the research methods by which these aspects can be examined with scientific rigor. The concept and classification of grasslands Vegetation of grasslands, plant groups, aspects of their characterization, and methods of investigation Factors influencing grassland yield, aspects and methods of their investigation Aspects and methods of investigating the quantity of grassland yield Aspects and methods of investigating the quality of grassland yield	A 15–20 page essay on a topic related to the research subject and its defense.
Scientific evaluation of grassland feed products and utilization of grassland	Dr. Nagy Géza	The research methodology course outlines, from a systems perspective, the aspects that are significant in the research of forages derived from grasslands and grassland utilization methods according to the current state of science. With the help of an international handbook, it reviews the research methods by which these aspects can be examined with scientific rigor. Forages derived from grasslands Scientific aspects and methods of investigating the evaluation of grassland forages Methods of evaluating grassland forages Scientific aspects of researching feed intake Methods of researching and scientifically investigating feed intake Scientific aspects of researching pasture as a production environment Methods of scientifically investigating pasture as a production environment Scientific aspects and methods of investigating silage making Scientific aspects and methods of investigating hay making Scientific aspects and methods of investigating animal production on pasture	A 15–20 page essay on a topic related to the research subject and its defense

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
Aquaculture	Dr. Bársony Péter	The aim of the course is to familiarize students with the latest results and trends in aquaculture, whether in pond-based fish production or intensive aquaculture. The current state of aquaculture.Introduction of new species into production. Technological innovations in aquaculture farming methods. Recent developments in feeding practices. Product processing. Market changes. New directions in development	Colloquium
Animal health	Dr. Pálfyné Dr. Vass Nóra	The aim of the course is for students to be familiar with the basic concepts of animal health, its institutional and legal background, and to be able to recognize when an animal's behavior/appearance deviates from that of a healthy one. Students must know the most important infectious and non-infectious diseases, their prevention, the major zoonotic pathogens, and the purpose of maintaining the health of food-producing animals and their role in food chain safety. During the lectures, the factors and conditions that may lead to the development of diseases in animal husbandry are presented. The most important living and non-living pathogens are discussed, along with the vital signs of healthy and sick animals. Students are introduced to the basic clinical values of domestic animals, the steps of clinical examination, and supplementary diagnostic tests. In the second part of the course, the most important infectious and non-infectious diseases are covered by species. Special emphasis is placed on current animal health legislation, up-to-date protocols, and epidemiological issues. The institutional system of veterinary public health Legal aspects of animal health and food hygiene Clinical baseline values of healthy animals, basic physiological concepts Examination of healthy and sick animals Supplementary clinical examinations Living and non-living pathogens Metabolic diseases General epidemiology, prevention of diseases Poultry diseases Swine diseases Diseases of small ruminants Equine diseases Cattle diseases Diseases of the rabbit and companion animals	Colloquium
Animal species identification by molecular biology tools	Dr. Czeglédi Levente	The aim of the course is to present molecular biology methods that can be used to detect animal species applied in food production and to identify them from other biological samples as well. In the theoretical course, the principles, applicability, and limitations of these methodologies are introduced. Through numerous practical examples, students will gain a clear overview of the range of analytical tools available for species identification. DNA-based identification techniques are followed by protein-based analyses and their theoretical background, then the link between fatty acid determination, fatty acid composition, and origin verification possibilities is demonstrated. Sampling, sample handling, labeling Sample preparation for DNA-based procedures Principles and applications of PCR methodologies, sequencing Application of PCR-RFLP in species identification Application of PCR-SSCP in species identification Application of PCR heteroduplex analysis in species identification Application of PCR-DGGE and PCR-TTGE in species identification Application of capillary electrophoresis in species identification Application of allele-specific labeled probes in species identification	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		Sample preparation for protein analyses Application of 1D PAGE and 2D PAGE in species identification Application of immunoassay and liquid chromatography in species identification Origin verification based on fatty acid composition	
Physiological properties of animal derived food products	Dr. Csiki Zoltán	The course introduces students to the components and nutritionally relevant constituents of animal-derived products. It provides a comprehensive overview of the symptoms, prevalence, and potential treatments of the most common food allergies and intolerances. Furthermore, it highlights the significance of animal-derived products in maintaining a balanced diet, with particular emphasis on childhood and pregnancy.	Colloquium
Possibilities in improvement of functional food of animal origin	Dr. Csiki Zoltán	Within the framework of the course, students will become acquainted with the principles of healthy nutrition, followed by the requirements related to functional foods. Building on this foundational knowledge, they will gain insight into the processing operations of various animal-derived products, as well as their potential for fortification and product development.	Colloquium
Products and co-products of animal production in circular agriculture	Dr. Nagy Attila	Students will become familiar with circular processes in animal production, including the life-cycle assessment of by-products generated on livestock farms and in slaughterhouses, as well as their utilization either as products or as raw materials in agriculture (e.g., nutrient supply) or as sources of energy. In addition, they will gain insight into the life cycle of animal production processes and products, as well as the methodological approaches used for their analysis. Key topics include: The concept and role of circular farming in animal husbandry The expansion and tools of the circular economy The EU Circular Economy Action Plan and amendments to key EU waste management legislation The European Commission's role in the circular economy Indicators and models for assessing environmental impacts Emission sources and life-cycle analysis Impact processes associated with animal production Material and energy flows related to emissions in animal production Life-cycle assessment of products generated on livestock farms Manure management methods Utilization of livestock farm by-products as products Life-cycle assessment of livestock farm by-products Life-cycle assessment of slaughterhouse by-products Utilization of slaughterhouse by-products as products	
Livestock Policy	Dr. Jávor András	Topics covered: The economic purpose and the objectives of animal breeding History of animal husbandry worldwide Structure of global animal husbandry History of animal husbandry in Hungary Structure of Hungarian animal husbandry Methods and possibilities of state intervention in EU animal husbandry Breeding organization in Western European countries Breeding organization in Hungary Protectionist measures in EU animal husbandry and the possibilities of domestic adaptation Gene reserves, gene conservation, and protected domestic and major foreign breeds Outstanding figures in animal husbandry Breeders' and producers' interest representation in Hungarian and Western European animal husbandry The Animal Breeding Act The Animal Health and Feed Act	Colloquium
Biochemistry of animal-origin food production	Dr. Csapó János	**Course Aim** The aim of the course is to familiarize students with the major areas of biochemistry, including biological processes and biocatalysis, metabolism, energy transformation and storage, the	Colloquium (írásban és szóban)

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		tricarboxylic acid cycle, carbohydrate metabolism, lipid catabolism and biosynthesis, amino acid metabolism, nucleotide metabolism, the degradation and synthesis of purine and pyrimidine bases, and the composition of polynucleotides. The lectures conclude with protein biosynthesis, focusing on the realization of genetic information. Beyond general biochemical knowledge, the main objective is to highlight the biochemical differences among domestic animal species. Accordingly, after the general sections, each chapter emphasizes the differences between monogastric animals, ruminants, and poultry in processes such as digestion, excretion, and gluconeogenesis. The biochemistry of milk production is also discussed in detail. **Course Description** The course begins with an introduction to the constituents of living organisms, covering the functions of amino acids, peptides, proteins, carbohydrates, lipids, mononucleotides, and polynucleotides. This is followed by an exploration of biochemical processes and biocatalysis, with particular attention to the relationship between structure and function in enzymes and the regulation of enzyme activity. Students will study metabolism in general, focusing on the energy requirements of living organisms and the turnover of energy and materials. The central role of the tricarboxylic acid cycle in metabolism and energy balance is analyzed in detail. Carbohydrate metabolism is presented through the degradation and biosynthesis of carbohydrates, gluconeogenesis from pyruvate and other sources, and the formation of hexose derivatives from glucose. Lipid metabolism is introduced in two parts: catabolism, including β-oxidation of fatty acids, the energy balance of fatty acid oxidation, the formation and oxidation of ketone bodies, and regulatory mechanisms; and biosynthesis, including the synthesis of saturated and unsaturated fatty acids, the formation of glycerides, the interrelations between carbohydrate and lipid metabolism, and the biosynthesis of non-hydrolyzable lipids. Amino acid metabolism is addressed both from the perspective of catabolism and biosynthesis. Protein digestion, common reactions in amino acid degradation, the breakdown of carbon skeletons via the tricarboxylic acid cycle, and nitrogen excretion in mammals and birds (urea and uric acid synthesis) are covered, together with the synthesis of non-essential and essential amino acids and the regulation of amino acid biosynthesis. Nucleotide metabolism is introduced through the degradation and synthesis of purine and pyrimidine bases, the biosynthesis of nucleotide coenzymes, and the biochemical basis of metabolic disorders related to nucleic acids. Students will also study the structure of DNA and RNA, the principles of nucleic acid synthesis, and the stages of protein biosynthesis in eukaryotes. The course concludes with the biochemical basis of milk production, emphasizing the synthesis of milk components and their significance in animal physiology.	
Genetic and molecular biology basics of nutrition research based on animal model systems	Dr. Máthé Endre	**Course Description** The deductive research strategy in nutrition science begins with the desired physiological effect and, from this starting point, explores the possibilities for developing new food products. The outcomes of this approach include functional foods and, based on them, targeted, individualized preventive and/or therapeutic nutrition strategies. The aim of the course is to familiarize doctoral students with the theoretical foundations and practical considerations of deductive nutrition research. The course provides an overview of relevant model organisms as well as inter- and multidisciplinary research methodologies. Particular emphasis is placed on understanding the nutrition-related interactions between the multicellular organism and its constituent cells, alongside the applications of genetics and molecular cell biology in this context. **Topics Covered** Challenges of inter- and multidisciplinary research in the light of systems biology approaches (networks and fractals) Nutrition research using animal model organisms Structural and functional relationships of the cell	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		Cellular metabolism Regulation of the cell cycle Molecular mechanisms associated with cellular macro- and micronutrient and energy status, and their regulation The fractal-like system of gerontogenes: lifespan regulators, mediators, stress resistance, housekeeping genes, mitochondrial regulators, senescence, and apoptosis genes Innovative feed and food development based on nutritional genetics and genomics	
Poultry breeding	Dr. Mihók Sándor	**Course Aim** The aim of the course is to provide students with a level of knowledge in poultry breeding and poultry production that meets the expectations for those pursuing a scientific degree in this field. **Poultry Hatchery Science** Structure of the hatching egg, preservation and handling of its quality from laying to incubation. Physiological and biochemical characteristics of egg (oocyte) production. Embryonic and fetal development processes in relation to embryonic metabolism across various poultry species and types. Critical phases of incubation. Practical implementation of artificial incubation with particular emphasis on quality assurance and quality preservation. **Poultry Genetics** Genotypic effects shaping qualitative genetic traits. Hybridization phenomena across different poultry species. Role of molecular genetics in breeding selection. Specific features of selection and breeding value estimation compared with species of longer generation intervals. Establishment and operation of breeding and multiplication tiers to ensure product-oriented production. **Production Systems** Design and significance of the all-in, all-out system for different poultry species. Analysis of housing technologies and management systems by species. Opportunities and rationale for improving production (genotype × environment interactions). Requirements of organic livestock farming. Conditions for implementing organic poultry production. Precision production techniques and the advancing role of robotics in production processes. **Nutrition** Biochemical, nutritional-physiological, and microbiological aspects of energy, protein, and mineral metabolism in poultry. Energy and protein evaluation of poultry feeds. Non-starch polysaccharides (NSP) in feed components. Chemical and physiological effects of anti-nutritional factors on metabolism. Utilization of enzymes, antibiotics, pro- and prebiotics, organically bound minerals (chelates), vitamins, organic acids, and other feed additives for efficient and rational production. Microbiological and hygienic status of feeds. Fungal and bacterial contamination and spoilage of feeds. Environmental impact of improper feeding practices. **Genetic Resource Conservation** Protection of genetic reserves in individual poultry species.	Colloquium
Biotechnology	Dr. Pálfyné Dr. Vass Nóra	**Course Aim** The aim of the course is to introduce students to the biotechnical and biotechnological methods applied in animal breeding. **Course Description** The course provides an overview of genetic investigations aimed at identifying carriers of undesirable traits, genetic defects, and disease susceptibilities. Special attention is given to the role of molecular genetics in animal breeding, such as BLAD in cattle, stress sensitivity in pigs, and prion genotypes associated with scrapie susceptibility or resistance in sheep. Cytogenetic approaches are also discussed, with emphasis on chromosomal	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		analyses for detecting balanced carriers of abnormalities, including the cattle 1;29 translocation and reciprocal translocations in pigs. In addition, the course addresses the identification of favorable traits through molecular genetics, such as the booroola sheep fecundity gene, as well as cytogenetic methods including sex determination of sperm cells and embryos. Reproductive biotechnologies form another major part of the course, covering the production and verification of sex-determined and sex-oriented sperm by flow cytometry and FISH, embryological techniques such as biopsies and diagnostic testing for sex, defects, and desirable traits, and advanced technologies including cloning from embryonic and somatic cells, chimera production, and the induction of tetraploidy and triploidy in fish and mollusks such as oysters. The course further explores genomics and molecular techniques, including gene mapping, gene transfer, gene knockout, gene silencing, and biometric approaches to identifying and utilizing associations between major genes and their markers. Applications in animal production and beyond are also considered. These include biotechnology in nutrition through feed cultivation, processing, and digestion; the production of pharmaceuticals such as human coagulation factors in transgenic small ruminants and organs for xenotransplantation from pigs; the use of biotechnology in food production, exemplified by cheese manufacture and casein genotypes; and industrial innovations, such as spider silk production in goats.	
Development of living space	Dr. Szendrei László	**Course Aim** The aim of the course is to present habitat management and development technologies and methods that, in light of ongoing changes in the agricultural environment, can increase population density and sustainable harvest levels of game species, particularly small game in field habitats. **Course Description** The course examines the population dynamics of game species inhabiting agricultural landscapes and the historical transformations of these habitats, with particular attention to their effects on wildlife populations. It addresses the environmental requirements of small game species and the influence of habitat structure on population levels. Special emphasis is placed on field habitat management, including the protection of grassland habitats, the establishment of pesticide-free field margins, set-aside practices, and case studies from Hungarian habitat management programs. The course also provides an in-depth analysis of the forest ecosystems that serve as the primary habitat for big game species. It introduces methods for mapping and characterizing forests of different ages and species compositions, and explores silvicultural technologies that can enhance the natural carrying capacity of forests, integrated with wildlife needs through forest management planning. Students will gain knowledge of the general state and significance of forestry in Hungary, the main coniferous and deciduous tree species, site conditions including soil, climate, topography, and hydrology, as well as the selection of suitable tree species. The study of natural forest associations and forest regions is also included. Further topics cover opportunities for habitat development in forest environments, the effects of natural and artificial forest regeneration on wildlife management, and the relationship between silviculture and game management.	Colloquium
Separation techniques in animal derived food analysis	Dr. Csapó János	**Course Aim** The aim of the course is to familiarize students with modern separation techniques that are increasingly applied in the analysis of raw materials of animal origin and the food products derived from them. Students will gain a solid understanding of chromatographic separation methods, including high-performance liquid chromatography (HPLC) and gas chromatography (GC). Following the theoretical foundations, they will acquire the knowledge needed for practical application	Colloquium (verbal and written)

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		and, at minimum, develop the competence to select the most appropriate methods required for their doctoral research projects. **Course Description** The course begins with an overview of the importance of chromatography in food analysis, followed by the theoretical background and discussion of the principal chromatographic methods. Detailed attention is given to the theory and practice of high-performance liquid chromatography and gas chromatography, with emphasis on their implementation in food composition analysis. The application of different chromatographic methods to food analysis is presented through case examples, including ion-exchange column chromatography of amino acids, HPLC separation and determination of proteins, vitamin analysis, and carbohydrate profiling. The determination of fatty acid composition by GC and the analysis of volatile fatty acids are also addressed. The course concludes with the study of coupled chromatographic techniques, focusing on the use of mass spectrometry in combination with chromatographic methods for advanced analytical applications.	
Embriology	Dr. Macháty Zoltán	**Course Aim** The general aim of the course is to familiarize students with the principles and mechanisms underlying embryo formation and development. **Course Description** Within the framework of the course, students will gain an overview of the most important aspects of embryology in mammals, with special emphasis on domestic animals, as well as the latest research findings in the field. The course covers oogenesis and folliculogenesis, spermatogenesis, and the processes of meiosis and fertilization. It also addresses sex determination, the stages of preimplantation development, and the mechanisms of maternal recognition of pregnancy. Further topics include implantation, placentation, and the physiological processes of gestation and parturition. By integrating both classical knowledge and current research, the course provides a comprehensive foundation in mammalian embryology, with direct relevance to animal science and veterinary applications.	Colloquium
Forest and Game Management Policy	Dr. Rédei Károly	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of Hungarian forestry and wildlife management policies and strategies. Through the study of their foundations, students will gain insights into the role, significance, and future objectives of these sectors. **Course Description** The course introduces the principal characteristics of Hungarian forestry and wildlife management, their legal and regulatory frameworks, and the tasks of the relevant administrative bodies. Particular attention is given to the planning responsibilities associated with forestry and hunting, including forest management and game management plans. Students will study the priorities of the National Forest Strategy, the main features of Hungarian forestry such as forest cover, principal tree species, and both material and immaterial goods provided by forests. The foundations of the 2009 Forest Act and its 2017 amendments are discussed, together with the structure of Hungarian forestry administration and the responsibilities of forestry authorities. The function and purpose of forest management plans are also covered. The course further examines the main features of Hungarian wildlife management, the legal framework governing the sector, and the planning tasks involved in wildlife management activities.	Colloquium
Ethology	Novotniné Dr. Dankó Gabriella	**Course Aim** The aim of the course is to draw attention to the influence of key environmental factors—climate, housing conditions, and feeding practices—on the behavior and productivity of farm animals. **Course Description** The course introduces the characteristic behavioral patterns of different age groups and production types of farm animal species. It examines the main categories of animal behavior, including nutrition, reproduction, orientation, and social	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		interactions, with an emphasis on species-specific differences. The relationship between animal behavior and productivity is analyzed, with particular focus on behavior as an indicator system for assessing welfare and production outcomes. The course also addresses the development of abnormal (pathological) behavioral patterns resulting from inadequate environmental conditions, their negative impacts on production and welfare, and strategies for prevention and management.	
Species protection and ecosystem regulation	Dr. Penksza Károly	**Course Aim** The aim of the course is to provide students with a comprehensive overview of species conservation planning through both Hungarian and international examples. **Course Description** The course introduces the theoretical foundations of conservation management, with a focus on traditional farming practices, habitat protection and management, and the development of management plans. Particular emphasis is placed on species conservation plans and their role in preserving biodiversity. Students will examine bird protection programs, the ecological impacts of large herbivores in natural and artificial ecosystems, and the conflicts that arise from these interactions, together with potential solutions. The curriculum also provides a detailed treatment of grassland management, including the management of pastures and meadows, as well as the role of wooded pastures in landscape and biodiversity conservation. Additional topics include the zoological foundations of species protection and ecosystem regulation, predator management and protection in relation to human-wildlife conflicts, and the specific challenges of conservation in agricultural lands and urban environments.	Colloquium
Sustainable animal keeping systems and technologies	Dr. Béri Béla	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of sustainability challenges in modern animal production systems and to introduce methods and technologies that reconcile efficiency with environmental protection and biodiversity conservation. **Course Description** Sustainability represents an increasing challenge for agriculture in the context of globalized intensive production, where extensive systems and environmentally friendly technologies are gaining importance. Students will acquire an overview of both intensive and extensive animal husbandry systems, learning to evaluate animal production in terms of sustainability requirements, environmental impacts, and possible interventions to mitigate negative effects. The course addresses genetic and selection systems aimed at improving the efficiency of animal production, with a focus on sustainable practices and long-term breeding processes. Nutritional strategies are also discussed in relation to their role in sustainability and in reducing the environmental footprint of livestock production. Special emphasis is placed on indigenous and endangered domestic breeds, highlighting their role in the preservation of genetic resources and biodiversity. Breeding methods for the maintenance of traditional and native breeds are introduced, with the aim of ensuring long-term genetic diversity. Environmental aspects of animal feeding and production are explored, including options to reduce nitrogen, phosphorus, potassium, and methane emissions. Environmentally friendly technologies in animal husbandry and livestock production are presented, alongside the environmental evaluation of production systems, feed processing, preservation, and compound feed manufacturing. The importance of harmonizing housing conditions with environmental factors in sustainable livestock farming is emphasized. The course also covers grazing systems and their impact on pastures and soils, with particular reference to the challenges of sensitive nature conservation areas. Organic and ecological farming methods are introduced, together with the principles of recycling organic materials and by-products into natural ecological cycles.	Colloquium (szóban)

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
Genetics and selection	Dr. Komlósi István	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of the applications and new opportunities of population genetics in animal breeding. **Course Description** The course explores the integration of classical and molecular genetics in breeding programs, highlighting their complementary roles in understanding the genetic background of trait relationships. Students will study the principles and methods of breeding value estimation, as well as the challenges associated with achieving genetic progress while managing the reduction of genetic variance. Attention is given to mating designs in both small and large populations, including the implications of inbreeding and heterosis breeding. The course also addresses the principles and practices of resistance breeding, offering students a modern perspective on how population genetics can be applied to improve the resilience, productivity, and sustainability of livestock populations.	Colloquium
Gene conservation	Dr. Mihók Sándor	**Course Aim** The aim of the course is to provide students with an in-depth understanding of the concept of genetic reserves in animal breeding, the arguments for and against their protection, and the methods used for conservation and preservation. **Course Description** The course begins with an introduction to the general principles of gene conservation, preservation, and rescue, and examines the historical development of livestock genetic resource protection—from instinctive safeguarding to organized conservation programs first initiated in developed countries and later extended worldwide. Students will become familiar with international and Hungarian institutions and organizations engaged in the protection of traditional domestic breeds. The course discusses the selection and ranking of gene bank populations, considering founder animals, family and line structures, and the role of genetic diversity in relation to bottleneck effects. Practical methods for maintaining small and endangered populations are introduced, including in situ and ex situ conservation, blood renewal, subdivision into subpopulations, and rotational mating schemes. Criteria for selecting populations for conservation are also covered, with attention to degrees and categories of endangerment, effective population size, genetic diversity, and the study of population genetic structure and distance. Students will further study the theoretical foundations of selection in genetic conservation, including issues of inbreeding and kinship, strategies to minimize genetic drift, and methods for monitoring inbreeding levels. The management of genetic defects and culling practices are also addressed. The reconstruction of breeds is discussed in detail, including approaches for re-establishing mixed-background breeds, purification, reconstitution using cryopreserved embryos, and breed-transforming crossbreeding to revive endangered populations. Finally, the course examines the genetic conservation status of Hungarian traditional domestic breeds, presenting species-specific methods for the preservation of genetic resources and breeding techniques used in practice.	Colloquium
Fish farming	Dr. Stündl László	**Course Aim** The aim of the course is to provide students with detailed theoretical knowledge of national and international trends in fish production, the main technological and methodological foundations, and the species produced. The course also aims to explore the interconnections between these elements, introduce sustainable and environmentally friendly production methods, technologies, and systems, and familiarize students with the economic principles of fish farming. **Course Description** The course begins with an overview of aquaculture development and trends worldwide and in Europe, followed by an analysis of the current situation and future development opportunities in	

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		Hungarian fish production. Students will gain an understanding of the theoretical foundations of freshwater fish farming and fisheries management, including biological aspects such as water, fish, and the natural environment; social dimensions; and economic and legal considerations. The technological bases of pond aquaculture are presented in detail, including genetics and breeding, nutrition and growth, fish flesh quality, disease prevention and treatment, water quality regulation, and environmental interactions. Pond-based technologies are explored through the study of broodstock management and reproduction, fry rearing, market fish production, organic fish farming, and specialized pond methods such as "pond-in-pond" and pond recirculation systems. The multifunctional role of pond farms is also examined. Further topics include integrated, environmentally friendly, and resource-efficient fish production technologies such as cage culture, flow-through and recirculating systems, integrated multi-trophic aquaculture (IMTA), and aquaponics. The technical equipment of pond farms, farm management, resource use, and labor management are discussed. The course concludes with the study of fish processing, trade, and marketing, with particular attention to consumer demand and market trends.	
Fish ecology and protection	Dr. Juhász Lajos	**Course Aim** The aim of the course is to familiarize students with the ecological role of natural fish communities, emphasizing individual- and population-level ecological characteristics and the ecological interactions between fish and their environment. **Course Description** The course introduces the classification of freshwater fish habitats, including rivers and standing waters, and examines the ecological traits of fish communities at both the individual and community levels. Special attention is given to the influence of environmental factors and their changes on community structure, as well as to evaluation systems such as the National Biodiversity Monitoring System. Students will analyze the consequences of habitat degradation and destruction, the barriers that hinder fish migration, and the impacts of non-native and invasive species on native populations. The course also provides an overview of the legal frameworks for fish conservation, tracing the historical development of Hungarian regulation and situating it within the broader context of international legislation. Conservation aspects are discussed in relation to both protected and strictly protected species. Finally, practical approaches to fish conservation are presented, including fish passages, artificial spawning habitats (fish nurseries), and ecological fisheries management, offering students both theoretical foundations and applied perspectives in freshwater fish conservation.	Colloquium
Hidrobiology	Dr. Nagy Sándor Alex	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of hydrobiology, focusing on aquatic environments, their ecological characteristics, and their biological communities. **Course Description** The course introduces the scope of hydrobiology and the role of water as an environment, including the formation of riverbeds and lake basins, water movement, water balance in lakes, and the classification of standing and running waters. Key physical aspects such as temperature, thermal stratification, freezing and thawing processes, and light climate with biological implications are addressed, alongside the chemical characteristics of natural waters. Students will study aquatic habitats and communities in both lentic and lotic systems, with detailed discussion of plankton, nekton, neuston, pleuston, and benthic communities, as well as aquatic vegetation. The course also covers nutrient and material cycles in aquatic ecosystems, biological production, community metabolism, and the fundamentals of trophic dynamics, including production, consumption, and decomposition.	Participation in the course, regular consultations, conducting laboratory tests, and fulfilling examination requirements.

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		Further topics include the biology of waters and the principles of water quality assessment. The major categories of water quality—such as salinity, trophic state, saprobity, and toxicity—are discussed, along with the concept of ecological water quality. Methods used to determine biological and chemical components of water quality are presented, with emphasis on data interpretation and the integration of different approaches. Finally, the formation and ecological significance of wetlands are introduced, highlighting their role in ecosystem functioning and biodiversity conservation.	
Intensive fish culture	Dr. Váradi László	**Course Aim** The aim of the course is to introduce students to intensive fish rearing systems and technologies, which play an increasingly important role in aquaculture production. The course examines the characteristics and applications of these systems, with particular attention to their environmental, economic, and social sustainability, as well as the perspectives for intensive aquaculture in Hungary. **Course Description** The course begins with the definition of intensive aquaculture and its development over the past decades. The theoretical foundations of intensive fish rearing are presented, including genetics and breeding, nutrition, growth, and flesh quality, disease prevention and treatment, water quality management, and environmental interactions. Students will study a range of intensive technologies: pond-based systems such as traditional small-pond systems, the Partitioned Aquaculture System (PAS), and In-Pond Raceway/Pond-in-Pond (IPR/PIP) systems; flow-through systems; recirculating aquaculture systems (RAS); cage culture; and alternative methods such as biofloc and aquaponics. Intensive aquaculture is further examined as part of circular economy approaches, with focus on Combined Intensive–Extensive (CIE) systems and Integrated Multi-Trophic Aquaculture (IMTA). The course also addresses the technical equipment of intensive systems, their safe and reliable operation, and the management of intensive aquaculture enterprises with emphasis on sustainability—particularly energy management, environmental interactions, and social acceptance. The role of precision farming, digitalization, information technology, and artificial intelligence in intensive aquaculture is explored. Finally, the course provides insights into practical experiences with intensive fish rearing systems, especially RAS, including their use for freshwater species and in inland regions far from seas. The current situation and future development perspectives of intensive aquaculture in Hungary are also discussed.	Colloquium
Sheep breeding	Dr. Jávor András	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of sheep production, its global and national economic significance, and the main directions of development in the sector. **Course Description** The course introduces the fundamentals of sheep breeding, beginning with domestication and its impacts, the main value-determining traits of sheep, and the relationships among these traits. The theoretical and practical aspects of breeding methods are examined, alongside an overview of the most important sheep breeds worldwide and those raised in Hungary. Reproductive biology and management form an integral part of the course, with emphasis on the biological basis and practical approaches for increasing fertility and prolificacy. Nutrition is addressed in detail, including the biological and physiological characteristics of sheep nutrition, the principles and practice of feeding breeding stock, and the specific feeding requirements of ewes depending on physiological status. Feeding strategies for rams during and outside the breeding season, the rearing of male and female young stock, and the characteristics of fattening are covered, as well as the feed resources available for sheep and their utilization.	Colloquium

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Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		Students will also study housing technologies, building types and equipment, mechanization, and the relationship between sheep and pastures or stubble fields. Biotechnological and biotechnical methods in sheep breeding are discussed, together with wool harvesting, shearing techniques, and the organization of shearing. The basics of work organization are introduced, including labor requirements, stockmanship, and the use of sheepdogs. The course further explores the principles of livestock technologies, including housing, husbandry systems, climate control, and bedding management, with special attention to technological solutions commonly applied in Hungary. Opportunities for mechanization and automation in sheep production are highlighted. The placement of sheep of different ages and production purposes is presented, as well as grazing technologies applicable to different livestock species. Finally, the course compares technological variations across different farm sizes, from smallholdings to large-scale enterprises, and addresses specific management practices adapted to scale..	
Horse breeding	Dr. Mihók Sándor	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of horse breeding and utilization, tracing its historical transformations and contemporary relevance within changing social and cultural contexts. **Course Description** The course begins with an overview of the changing roles of horses throughout history, from ancient civilizations and early European horse cultures to the development of historic studs in Europe and Hungary. It examines the characteristics and evaluation of the so-called immaterial era of horse breeding, with attention to modern horse-breeding nations, horse racing, equestrian sports, and the principles of functional conformation in the context of contemporary use. Students will study the housing and management technologies applied in horse breeding, including species-specific requirements, forms of utilization, labor use, feeding techniques, and animal welfare. The course provides an overview of horse breeds and the role of genetic resources in horse breeding, with special attention to endangered domestic and foreign breeds. Hungarian examples, such as the Lipizzaner and Hucul horses, are discussed in terms of their recognition as valuable genotypes within international breeds, while the risks of crossbreeding and the conservation status of the Hungarian donkey are also considered. Breeding techniques are addressed, covering methods that exploit additive genetic effects, the creation of synthetic populations, pedigree verification, DNA analyses, and assisted reproductive technologies. Performance testing is examined in detail, including the code of testing, breeding value estimation, selection methods, index selection, and the specific evaluation procedures applied in equestrian sports, specialized competitions, and horse racing. Finally, the course discusses breeding programs and administrative aspects of horse breeding, including professional oversight and regulatory frameworks relevant to the sector.	Colloquium
Bee biology	Dr. Sárospataki Miklós	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of bees (superfamily Apoidea), a group of insects of great biological, ecological, and economic importance. **Course Description** The course introduces the fundamental biological and breeding-related knowledge of the honeybee (*Apis mellifera*), while also presenting other wild bee groups, including bumblebees and mason bees. Students will become familiar with their morphology, anatomy, and taxonomy, as well as their conservation and economic significance. Through this, the course offers both theoretical and applied perspectives on bees, emphasizing their roles in ecosystems, agriculture, and biodiversity preservation.	The course will be taught in a block schedule. Students are expected to prepare for the assessment based on the lecture materials and the handouts provided. The assessment will take place at the end of the course in the form of a colloquium

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Beekeeping	Dr. Oláh János	**Course Aim** The aim of the course is to provide students with a detailed understanding of bee biology and social behavior, the plant species of the Hungarian flora most significant for apiculture, and the fundamental knowledge required for beekeeping practices. **Course Description** The course introduces the most important bee species and breeds, with particular focus on the morphology and anatomy of the honeybee (*Apis mellifera*). Students will study hive structures, the organization and life of bee colonies, and the main parasites and diseases affecting bees, together with principles of bee health management. The course also addresses apicultural products and their uses, offering insight into both their biological origin and their economic potential. In addition to theoretical foundations, students gain exposure to practical aspects of beekeeping through demonstrations, visits to apiaries, and honey-processing facilities. The course concludes with an overview of the current state and challenges of apiculture, situating beekeeping in its ecological and socio-economic context.	Colloquium
Microbiology	Dr. Peles Ferenc Árpád	**Course Aim** The aim of the course is to provide students with fundamental knowledge of microbiology to support the understanding of specialized and related subjects. The course introduces chapters of microbiology that are of particular importance for agriculture, drawing on the latest scientific knowledge and modern research findings. **Course Description** The course begins with an overview of the role of microorganisms in agriculture and the food industry, followed by the study of ecological factors influencing microbial growth and the interactions among these factors. Students will learn about the processes of microbial reproduction and death, as well as the major metabolic products of microorganisms. Special emphasis is placed on the role and significance of microorganisms in biogeochemical cycles and in fermentation processes. Practical applications are also addressed, including the microbiology of feed spoilage and preservation, microbial protein production, and manure treatment and maturation. The course covers pathogenic microorganisms, mycotoxin-producing fungi and their toxins, and the concept and application of indicator microorganisms. Students will gain hands-on experience in the cultivation of indicator microorganisms from feed and food samples, linking theoretical knowledge to laboratory practice.	Colloquium
Molecular genetics	Dr. Kusza Szilvia	**Course Aim** The aim of the course is to familiarize students with the tools and methods of molecular biology and their applications in animal breeding, while providing the knowledge required to apply these techniques in practice. **Course Description** The course begins with an introduction to animal breeding and the molecular basis of heredity, including the structure and properties of DNA and RNA, and the principles of Mendelian inheritance. Students will study DNA replication, protein synthesis, and the genetic code, followed by an overview of genomes, genome projects, gene structure, and genetic mapping. The course presents the types and applications of genetic markers in animal production, along with molecular genetic methods applied in practice. The concept of genetic imprinting is introduced, together with the use of direct gene tests in the breeding of sheep, cattle, pigs, horses, and goats. Special attention is given to the potential applications of molecular biology in the conservation of indigenous breeds, highlighting how genetic technologies can contribute to the preservation of genetic resources.	Colloquium
Ecology, biological conservation and animal welfare	Dr. Németh Attila	**Course Aim** The aim of the course is to provide students with an understanding of the foundations of ecology, conservation	Colloquium

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Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		biology, and animal welfare, enabling them to apply this knowledge in their own research programs. Students will explore the complex interactions between organisms and their environments, gain insight into the diversity of living systems and the importance of their protection, and become familiar with the challenges and solutions related to human–animal interactions. **Course Description** The course introduces the principles of ecology, including population ecology with a focus on population growth and regulation, interspecific relationships, community ecology, and global ecological processes. Applied aspects are also emphasized, covering the foundations of conservation biology, threats to biodiversity, the basics of conservation genetics, and the practical implementation of biodiversity protection. The second part of the course focuses on the fundamentals of animal welfare, including its historical background, ethical considerations, and contemporary challenges. Topics include ethical issues in animal husbandry, responsible pet ownership, and the problem of animal cruelty. Students will study animal welfare legislation and international agreements, and gain an understanding of practical approaches to animal welfare through examples of successful initiatives as well as the challenges faced in implementation.	
Breeding of endagered species	Dr. Mihók Sándor	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of the concept and significance of sustainable development in the conservation of traditional domestic animal breeds. The course emphasizes the professional and societal importance of preserving genetic resources, offers an international outlook on conservation efforts, and introduces the role of organizations and institutions engaged in this field. **Course Description** The course begins with an overview of the global and national context of genetic conservation, highlighting the activities of key international and domestic organizations such as FAO, UNEP, UNESCO, RBI, SAVE, RBST, and DAGENE. Special attention is given to the situation in Hungary and the Carpathian Basin, examining the status of traditional domestic animal breeds, their level of endangerment, their cultural and practical value, their unique products, and their distinctiveness compared to global livestock breeds. Students will explore the scientific background supporting breed conservation, including studies of genetic diversity and sustainability. Methods discussed include blood group and protein polymorphism analysis, population genetic investigations, DNA microsatellites, mtDNA analyses, and the use of molecular genetics to mitigate the risks of genetic drift. The role of cell cultures, stored DNA samples, and line and family breeding strategies in safeguarding genetic resources is addressed, along with the potential contribution of modern genetic technologies and biotechnologies to the preservation and utilization of valuable genes and gene combinations. The course also examines potential sources of valuable genetic resources, including hybrid lines, production breeds, performance-selected breeds, improved breeds, local breeds, unrecognized populations, hobbyist-kept herds, feral domestic animals, and populations found in successor states of the former Austro-Hungarian Monarchy. Finally, students will analyze the possibilities for market utilization of genetic resource populations. These include non-food functions such as organic livestock farming and habitat restoration in protected areas, as well as the production and marketing of traditional products. Emphasis is placed on short food chains, on-farm sales, laboratory-based product quality assessment, and the importance of origin verification, including the use of geographical indications.	Colloquium
Precision animal nutrition	Dr. Szabó Csaba	**Course Aim** The aim of the course is to introduce doctoral students to the foundations of *precision feeding*, a new and rapidly developing	

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		area of animal nutrition, and to present the possibilities for its application in modern livestock production. **Course Description** Precision feeding is an integral part of Precision Livestock Farming (PLF), and the course provides both theoretical and applied perspectives on this innovative approach. Students will first be introduced to the definition and key components of precision feeding, including the concept of *Total Nutrition.* The relationship between feeding and heat stress, nutritional immunology, and molecular nutrition are discussed, along with the links between molecular genetics and feeding strategies. The course also examines the development and use of next-generation feed additives, strategies for mitigating mycotoxin risks, and the role of compound feed as a potential risk factor in the production of animal-derived food. The concept of the *soil-to-consumer precision food production chain* is explored, alongside the applications of biotechnology in feed production. Further topics include sex-specific feeding strategies, the role of precision feeding in sustainable livestock farming, and future perspectives for the field.	
Proteomics in animal production	Dr. Czeglédi Levente	**Course Aim** The aim of the course is to provide doctoral students with a thorough understanding of proteome research, its significance, and the analytical methods applied in proteomics. Students will gain the theoretical knowledge necessary for planning proteomic experiments, identifying biomarkers, and evaluating results, while also developing a comprehensive perspective on the role of proteins in animal tissues and in raw and processed foods. **Course Description** The course introduces the concept of the proteome and the field of proteomics, beginning with sampling, sample preparation, and fractionation techniques. Students will study one-dimensional polyacrylamide gel electrophoresis (SDS-PAGE), two-dimensional polyacrylamide gel electrophoresis (2D-PAGE), two-dimensional differential gel electrophoresis (2D-DIGE), and blue native polyacrylamide gel electrophoresis (BN-PAGE). Protein detection methods are presented alongside the challenges associated with biomarker discovery. Mass spectrometry and its applications are discussed in detail, with emphasis on its role in protein identification and characterization. Case studies and sample projects are used to illustrate practical applications, including the proteomics of milk, meat, eggs, blood, and other tissues. Through these topics, students will gain insight into how proteomic research can support animal science by addressing biological questions related to value-determining traits and improving the quality and safety of animal-derived products.	Colloquium
Pig breeding	Novotniné Dr. Dankó Gabriella	**Course Aim** The aim of the course is to familiarize students with the current issues of the pig sector in Hungary and internationally, and to provide knowledge of modern technological systems, the latest findings in nutrition and reproductive biology research, and their practical applications. **Course Description** The course begins with an overview of the present situation of the Hungarian pig industry, including current challenges and governmental policy measures. Breeding methods applied in pig production are introduced, with particular focus on hybridization and breeding value estimation as tools of genetic improvement. The role of industrial-scale pig production systems and modern technical solutions in contemporary housing technologies is also discussed. Students will study the reproductive biology of pigs, including the physiology of sows and boars, reproductive technologies, and the genetic and management factors influencing prolificacy. Assisted reproductive techniques are presented, alongside the course of pregnancy, hormonal changes before and during farrowing, stages of parturition, hygiene in the farrowing unit, and the care of newborn piglets. Nutritional strategies are introduced according to age group and production purpose, with particular attention to muscle energy	Colloquium

OPTIONAL SUBJECTS			
Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
		metabolism and post-mortem biochemical processes that influence pork quality. The genetic and management factors affecting meat quality are analyzed in detail. Animal health issues relevant to pig production are addressed, including farm-level hygiene and biosecurity measures. Students will become familiar with the Pig Farm Certification System (SMR) and approaches for maintaining biosecurity. Special attention is given to stress syndrome in pigs, its genetic and management-related causes, symptoms, and strategies for prevention. Finally, the course examines forms of integration in the pig sector and their role in the development of Hungarian pig production.	
Reproduction biology	Dr. Rátky József	**Course Aim** The aim of the course is to provide students with both theoretical and practical knowledge of the planned reproduction of farm animals in line with defined breeding objectives. The course equips students with the ability to design and monitor reproduction programs in medium- and large-scale production systems, while also familiarizing them with the professional terminology and key concepts of reproductive biology, biotechnology, and related biotechnical practices. Students will acquire both general theoretical foundations and practical skills relevant to the field. **Course Description** The course begins with an overview of the significance of reproduction in animal breeding, followed by the anatomy and physiology of the reproductive organs of female and male animals. Students will study the neural and hormonal regulation of reproductive processes, the onset and characteristics of puberty, and the cyclicity of reproductive functions. Fertilization, pregnancy, embryogenesis, and fetal development are addressed, as well as parturition, the hormonal changes occurring before and during birth, the puerperium, and lactation. Behavioral aspects of reproduction across different livestock species are examined, alongside reproductive performance indicators specific to each species. Practical components of the course include semen collection, evaluation, processing (cooling and freezing), and the principles and practice of artificial insemination. Finally, the course explores reproductive management strategies, emphasizing the physiological basis for improving reproductive performance and the influence of environmental and nutritional factors on reproduction.	Colloquium
Szarvasmarha-tenyésztés	Dr. Béri Béla	**Course Aim** The aim of the course is to provide students with up-to-date knowledge of the global, European, and Hungarian cattle breeding sectors, highlighting their current situation and most important characteristics. The course equips students with an understanding of present practices and future opportunities in breeding, reproduction, housing, and nutrition. **Course Description** The course begins with an analysis of the factors shaping the global and European cattle industries, followed by a detailed examination of the current state and future prospects of cattle breeding in Hungary. Students will study the dairy and beef breeds used in Hungary, their evaluation, and their international reputation. The course covers the breeding methods applied in Hungarian cattle production, as well as the use and potential of modern biotechnical and biotechnological approaches. The role of molecular genetics in cattle breeding is discussed in both global and Hungarian contexts, together with the application of modern breeding value estimation methods across different production systems and their future possibilities. Students will also become familiar with the current state and main tasks of breeding organization in Hungary and the European Union, including the comparative evaluation of breeding programs across different breeds. The course explores the opportunities for applying precision livestock farming and precision feeding in cattle production, and discusses breeding,	Participation on lectures and , colloquium

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		housing, and nutritional strategies aimed at improving the efficiency of beef production.	
Feed evaluation and production technology	Dr. Szabó Csaba	**Course Aim** Building on the knowledge acquired during MSc studies, the aim of the course is to familiarize students with the latest methods of feed evaluation and analysis, the professional and technical background of feed production, and the theoretical and practical aspects of compound feed formulation. **Course Description** The course introduces the principles of feed evaluation and feeding technologies, beginning with the nutritional value of feed components and the fundamentals of feed analytics. Students will study methods for measuring the energy content of feeds and interpreting results, the role of non-starch polysaccharides (NSPs) and their effects on the performance of monogastric animals, and the application of near-infrared spectroscopy (NIR) in feed analysis. Further topics include ileal amino acid digestibility and the use of the ideal protein concept in diet formulation, as well as the digestion, utilization, and metabolism of amino acids. Students will also examine antinutritive factors and their effects on animal performance, and gain insight into the principles of feed formulation, the technical background of feed manufacturing, and the influence of feed processing on nutrient evaluation. The course also covers the legal and ethical aspects of feed production, along with feeding technologies applied in practice, equipping students with both theoretical understanding and practical perspectives in modern feed science.	Colloquium (verbal)
Milk and dairy products as functional food	Dr. Csapó János	**Course Aim** The aim of the course is to introduce students to the concept of functional foods, the chemistry and mechanisms of action of functional food components, and their extraction, production, and application. The course also addresses the technologies of functional food manufacturing and presents the most well-known product groups, highlighting their nutritional, physiological, quality assurance, and food safety aspects. **Course Description** Students will gain a detailed understanding of the categories of functional food components, with particular emphasis on plant oils, animal fats, and fatty acids such as MUFAs, PUFAs, omega-3 and omega-6 fatty acids, ALA, DHA, EPA, and CLA. The chemistry, biochemistry, and production possibilities of conjugated linoleic acids are discussed, together with CLA-enriched foods. Other bioactive compounds such as carotenoids, flavonoids, tocopherols, tocotrienols, phytosterols, and phytoestrogens are also studied.	Colloquium

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		Special product categories are explored, including margarines, yoghurts, cheese spreads, fish products, omega-3 enriched eggs, flaked foods, muesli, and fermented products. The course further examines food safety considerations, legal regulations, consumer expectations, ethical issues, and marketing aspects of functional products. A particular focus is given to prebiotics and probiotics, including the roles of *Lactobacillus* and *Bifidobacterium* in functional food production, as well as to colostrum and the bioactive components of milk. Students will study the technological and biological properties of bioactive compounds and their potential health-promoting effects. Topics include the health impacts of major milk proteins, the production and functionality of bioactive peptides, and the protective roles of colostrum lipids and conjugated linoleic acids. The health benefits of exopolysaccharides and oligosaccharides produced by lactic acid bacteria are presented, alongside the development possibilities of fermented dairy products such as sour milk, whey-based beverages, kefir, yoghurt, and cheese.	
Milk processing	Dr. Csanádi József	**Course Aim** The aim of the course is to provide students with up-to-date knowledge of milk quality, composition, and processing, as well as the safe and high-quality production of dairy products. **Course Description** The course begins with the primary handling of raw milk at the production site, including official and industrial quality assessment and acceptance procedures. Students will study the general processing operations of milk, such as filtration, clarification, separation, fat standardization, homogenization, and heat treatment, with a focus on technological guidelines and their consequences for product quality. The course provides a comprehensive overview of the processing technologies of milk and cream products, including fermented milk and cream preparations, with attention to achieving desired textures such as firm, whipped, and liquid consistencies. Butter production is presented in detail, covering raw material preparation, batch and continuous churning methods, and quality requirements. Cheese production is addressed through the classification of cheeses, the requirements for milk used in cheesemaking, the manufacture of rennet-coagulated cheeses, and the production of cottage cheese and cream cheese. Students will examine the technological factors influencing cheese yield and the processing of processed cheeses. Further topics include milk evaporation and drying technologies (spray and roller drying) for milk powder production, ice cream manufacturing, and the application of membrane technologies in the dairy industry. Finally, the processing and utilization of dairy by-products are also presented, offering a complete picture of modern dairy production systems.	Colloquium
Economy of milk production	Dr. Rózsáné Dr. Várszegi Zsófia	**Course Aim** The aim of the course is to provide students with a comprehensive understanding of dairy economics, including the role of milk production in the national economy and the agri-food sector, as well as the processes of milk acquisition, handling, and processing. Students will gain knowledge of the composition, nutritional importance, and properties of milk and dairy products, together with modern production technologies, market structures, and sustainability aspects. **Course Description** The course begins with an overview of the significance of dairy economics within the agricultural and food sectors, the history and development of milk production, and the nutritional role of milk and dairy products. Students will examine the structure and importance of the dairy sector, the animal species involved in milk production (cattle, goats, sheep), and the main farm types. Production costs, economic efficiency, and the factors influencing milk yield are analyzed, with emphasis on genetics, feeding, animal health, and the role of precision livestock farming in dairy production.	Colloquium

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		Milk composition and quality-determining factors are studied in detail, including standards, regulations, and testing methods. Students will gain insight into milk processing technologies, such as raw milk collection and storage, pasteurization, homogenization, heat treatment, and the role of microorganisms in dairy production. Further processing topics include cheese and butter manufacture, fermented dairy products (yoghurt, kefir), milk powders, and ultrafiltered products, as well as the management of by-products and waste, with a focus on sustainability and environmental protection. The course also explores the structure of dairy markets, demand and supply dynamics, consumer behavior, international market trends, pricing mechanisms, and support schemes. Marketing strategies, branding, and consumer preferences are addressed, alongside retail and wholesale approaches. Special attention is given to digitalization and precision technologies in dairy farming, including smart farms, automated milking systems, big data, IoT, robotics, and artificial intelligence. Finally, the course presents emerging product innovations, such as lactose-free and plant-based alternatives, functional dairy products, and their nutritional aspects. Risk management in the dairy sector is also covered, including responses to market volatility, natural disasters, disease outbreaks, and food safety challenges. Case studies and practical examples support exam preparation and consolidate the students' understanding of dairy economics in theory and practice.	
Population dynamics of wild animals	Dr. Németh Attila	**Course Aim** The aim of the course is to provide students with a solid grounding in population biology and population ecology, disciplines that are essential for practical conservation biology. Students will learn to apply these principles within their own research, with particular focus on the regulation of population size and key life-history traits such as reproductive output and extinction risk. Special emphasis is placed on Population Viability Analysis (PVA), a tool for predicting the long-term persistence of species within specific habitats. By mastering these concepts, students will be able to synthesize population data and evaluate it in the context of inter- and intraspecific interactions and environmental factors. **Course Description** The course begins with an introduction to fundamental concepts of population biology and ecology, including exponential and logistic growth models, life-history strategies (r- and K-selection), population structure by age and sex, and survival curves. Students will explore the significance of offspring quality, carrying capacity, and species–environment interactions, alongside spatial processes such as migration, area effects, and island biogeography. Further topics include population viability analysis (PVA) and metapopulation theory, as well as the mechanisms of intraspecific competition, adaptation, and niche segregation. Predator–prey dynamics and trophic interactions are examined in the context of both top-down and bottom-up regulation. The course also addresses the theoretical foundations of wildlife management, including the concept of maximum sustainable yield (MSY), conservation hunting, and the ecological and demographic consequences of overexploitation.	Colloquium

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Name of the subject	**Course instructor**	**The aim and description of the subjects**	**Requirements**
Conservation of the diversity of wild populations	Dr. Németh Attila	**Course Aim** The aim of the course is to provide students with theoretical and practical knowledge of biodiversity conservation, with special emphasis on the identification and management of endangered species and populations. The course highlights the dramatic erosion of biodiversity and the threats it poses to the survival of wild populations. Students will learn methods for data collection and analysis, especially in the case of rare and elusive species, and will gain insight into evidence-based conservation practices that enable the design and implementation of effective intervention plans. **Course Description** The course begins with the principles of evidence-based conservation, focusing on the identification of endangered species and populations, the role of conservation research, and the establishment of priorities for action. Students will examine methods of data collection, ranging from literature reviews and secondary sources to field surveys, with special attention to the challenges of studying rare or cryptic species. Further topics include paleoecology, zooarchaeology, and paleogenetics, as well as approaches to taxonomic problems such as species delimitation. The course covers phylogeography, biogeography, and mapping species distributions, together with the study of habitat and microhabitat preferences and ecological interactions. Monitoring systems, risk assessment, and the preparation of action plans are discussed as key tools in conservation planning. Students will also study the practical aspects of conservation genetics in managing small populations, along with reintroduction and translocation projects, habitat expansion, and habitat restoration. Finally, the course addresses the social dimensions of conservation, including legal frameworks, public awareness campaigns, education, and the role of citizen science in biodiversity protection.	Colloquium
Game ecology and protection	Dr. Juhász Lajos	**Course Aim** The aim of the course is to provide students with knowledge of the ecological role of natural wildlife populations, with a focus on both individual-level and population-level ecological characteristics. The course examines the ecological relationships between wildlife species and their environments, the factors threatening wildlife populations, habitat changes, and the sustainable use and protection of game species. Special attention is given to how wildlife adapts to environmental change. Students will also gain an overview of the current Hungarian and international legal frameworks for wildlife protection, the historical development of regulation, and the practical possibilities of wildlife conservation. Based on this knowledge, students will be able to synthesize and evaluate population data in relation to inter- and intraspecific interactions and environmental factors. **Course Description** The course introduces the basic concepts of population dynamics, including exponential and logistic growth models, life-history strategies (r- and K-selection), and the age and sex structure of populations. Students will study intraspecific competition, focusing on density-dependent and density-independent factors influencing population dynamics, and analyze the ecological relationships between wild species and their environments. Carrying capacity is addressed from both theoretical and applied perspectives. Further topics include spatial processes such as area effects, migration, and island biogeography, as well as the dynamics of expanding wildlife species. The course reviews Hungarian and international legal frameworks for wildlife protection, explores the main threats to wildlife populations, and presents practical approaches to conservation and management. The course concludes with a case study, where students independently analyze and evaluate a selected example of wildlife population management or conservation.	Colloquium
Evaluation of carcass and meat	Dr. Jávor András	**Course Aim** The aim of the course is to provide students with a thorough	Colloquium

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		understanding of the classification and evaluation of slaughter animals and carcasses, with emphasis on both traditional and modern methods. Students will gain insight into the regulatory frameworks, the SEUROP classification system, and the application of advanced technologies in determining body composition. In addition, the course covers the quality of meat from sensory, nutritional, food safety, and technological perspectives. **Course Description** The course begins with an overview of the history of slaughter animal classification, the relevant regulations, and the current methods of evaluation. Particular attention is given to the SEUROP classification system and its practical application. Students will explore advanced technological approaches to assessing body composition, as well as the components and determinants of carcass quality. Key topics include slaughter value, the proportion of valuable cuts, and tissue composition, along with the technological properties of meat that influence quality and usability. The course also addresses slaughtering techniques and technologies, highlighting their efficiencies and potential improvements. Finally, students will study the market-based evaluation of carcasses and meat, together with culinary and nutritional assessments that determine the value of meat for consumers and the food industry.	
Health of aquatic animals	Dr. Jeney Zsigmond	**Course Aim** The aim of the course is to provide students with knowledge of fish health, diagnostic methods, and disease management. Students will gain both theoretical and practical understanding of the examination of fish in the field and in the laboratory, the functioning of the fish immune system, and the prevention and treatment of diseases caused by pathogens, parasites, pests, and environmental stressors. **Course Description** The course begins with the methods of field and laboratory examination of fish, followed by an overview of the structure and function of the fish immune system. Students will study the etiology, pathology, and impacts of major fish diseases caused by viruses, bacteria, fungi, protozoa, helminths, leeches, crustaceans, and mussel larvae. Other important disease categories, including those caused by pests and environmental deficiencies or stressors, are also addressed. Special emphasis is placed on methods of treatment and disinfection, with a focus on the application of effective therapeutic approaches in aquaculture and fisheries. Students will acquire the skills to evaluate health problems in fish populations and to apply appropriate management and biosecurity measures to prevent and mitigate losses.	Colloquium