

## COURSE LAYOUT

### 1. GENERAL

<b>SCHOOL</b>	School of Animal Biosciences		
<b>DEPARTMENT</b>	Department of Animal Science		
<b>STUDY LEVEL</b>	Undergraduate		
<b>COURSE CODE</b>	6	<b>SEMESTER</b>	6th
<b>DEPARTMENT RESPONSIBLE FOR TEACHING</b>	Department of Animal Science		
<b>COURSE TITLE</b>	Applications of Biotechnology in Animal Production		
<b>INDEPENDENT TEACHING ACTIVITIES</b>		<b>WEEKLY TEACHING HOURS</b>	<b>ECTS</b>
Theory		2	2
Laboratory Practicals		2	2
			<b>4</b>
<b>COURSE TYPE</b> (Foundation course, General knowledge, Scientific area, Developing skills)	Scientific area – Developing skills		
<b>PREREQUISITES</b>	Biochemistry, Principles of cellular and molecular biology, Genetics, Genetic improvement, Methods in genetic improvement, Nutritional physiology of animals, Feed science and technology		
<b>LANGUAGE</b>	Greek		
<b>IS THE COURSE OFFERED for ERASMUS STUDENTS?</b>	YES (in English)		
<b>COURSE WEB PAGE</b>	<a href="https://oeclass.aua.gr/eclass/courses/EZPY189/">https://oeclass.aua.gr/eclass/courses/EZPY189/</a>		
<b>TEACHING PERSONNEL</b>	<p>Theory: Prof. K. Mountzouris, Assoc. Prof. A. Hager, Ass. Prof G. Theodorou</p> <p>Laboratory Practicals: Prof. K. Mountzouris, Assoc. Prof. A. Hager, Ass. Prof G. Theodorou</p>		

### 2. LEARNING OUTCOMES

<b>Learning Outcomes</b>
<p>The course of “Applications of Biotechnology in Animal Production” aims to educate students on issues related to applications of biotechnological methods, processes and nutritional bioactive ingredients targeting to improve Animal Production.</p> <p>Upon successful completion of the course students will:</p> <ul style="list-style-type: none"> <li>• understand and appreciate the importance of biotechnology to address current challenges in the livestock sector.</li> <li>• delve into the molecular processes of cells that control gene expression and protein synthesis (The central dogma of molecular biology). They will understand the structure of genomes and basic methodologies of their bioinformatic analysis.</li> </ul>

- understand the possibilities of utilizing Biotechnology in the field of Animal Husbandry. They will understand the concept of genetic variability and genetic markers. They will learn about animal molecular genotyping methodologies for specific polymorphisms and for numerous genetic markers. They will understand the applications of molecular genotyping in animal production, especially in animal genetic improvement, rare breed conservation and animal product provenance control.
- realize the effects of nutrients on the expression of various genes (nutrigenomics) that affect animal health and productivity and they will understand the importance and contribution of the “omics” technologies in the progress of nutritional science.
- understand the importance of biotechnological applications in the animal feed sector such as: production of new raw feed materials, upgrade of the dietary value of conventional feedstuffs and of various agro-food by-products, improvement of gut function and health (gut ecosystem), tailoring animal nutrition for higher productivity and product quality with emphasis on the overall food chain safety according to the farm to fork principle.
- get to know about the qualitative and quantitative determination of contaminants such as mycotoxins as well as the presence of genetic modifications in the feed (GM feed) with available state of the art analytical methodologies (PCR, ELISA, LC-MS/MS) and in accordance with the legal framework governing their detection levels.
- They will be trained in scientific writing and in searching, referencing and managing bibliographies.
- learn to handle databases and bioinformatics tools to analyze the available information and to evaluate them as to their suitability for specific applications.

#### **General Competence**

- Search, analysis and synthesis of data and information with the use of the required technologies
- Decision making
- Autonomous work
- Teamwork
- Work in a multidisciplinary environment
- Production of new research ideas

### **3. COURSE CONTENT**

- Introduction: Biotechnology and its role in Animal Production - modern challenges
- Basic concepts of molecular biology and introduction to molecular cloning. Methods of genetic engineering in livestock.
- Biotechnological applications of reproduction in farm animals
- Genomic analysis. Comparative genomics, genome mapping - Applications in bioinformatics.
- Applications of molecular biology in the certification of origin and adulteration of animal products.
- Applications related to genetic improvement: Methods for molecular genotyping of animals for qualitative and quantitative characteristics - parents authentication methods to reconstruct genealogical tree animals - Examples of transgenic farm animals for biomedical applications (gene pharming).
- Diet and gene expression (nutrigenomics): importance for animal health and productivity
- Objectives and prospects for improvement of animal nutrition - role of biotechnology

- Feed quality improvement - tools for enhancing the nutritional value of conventional feedstuffs as well as various agro-food by-products. Genetically modified feedstuffs and legal framework
- Microbial products (biomass, primary and secondary metabolites) - suitability and applications in nutrition
- Bioactive additives: Enzymes, Probiotics, probiotic bioactive substances, Amino Acids, Peptides, Acidifiers, Antibiotics - Growth factors
- State of the art databases and analytical detection techniques for the determination of contaminants and genetic modifications in feed.

#### 4. TEACHING and LEARNING METHODS - Evaluation

<b>TEACHING METHOD</b>	In class, face to face and via specialized teaching platforms (e.g. OpenClass, MS teams)	
<b>USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES</b>	PowerPoint and video presentations. Communication with students via e-mail. Teaching support through access to the e-class platform, to on-line databases and Specialized Software etc.	
<b>TEACHING ORGANISATION</b> (Lectures, individual or group assignments, field trips, individual study et.c.)	<i>Activities</i>	<i>Workload per semester</i>
	Lectures - Laboratory practice	48
	Literature search and analysis	32
	Writing assignments	20
	<i>Total Course</i> (25 hours workload per credit unit)	100
<b>STUDENTS EVALUATION</b>	<p>I. Theory</p> <p>a) Optional attendance of lectures by students (progress, assignments, etc.)</p> <p>b) Written final exam (100%) which includes: short essay questions and multiple choice and/or true/false questions</p> <p>II. Laboratory practicals</p> <p>Compulsory attendance of the laboratory exercises by the students, with attendance records (progress, assignments, exercises, etc.)</p> <p>III. The evaluation language is Greek</p> <p>IV. The evaluation criteria are communicated to the students</p>	

#### 5. BIBLIOGRAPHY

- Bedford M.R. and Partridge G.G. **Enzymes in farm Animal Nutrition**. 2010. Second edition, CABI, Oxfordshire, UK.
- EFSA. **Safety and nutritional assessment of GM plants and derived food and feed: The role of animal feeding trials**. Report of the EFSA GMO Panel Working Group on Animal Feeding Trials Food and Chemical Toxicology 46 (2008) S2–S70

- Griffiths, A.J.F., Wessler S., Carroll S.; Doebley J. **An introduction to genetic analysis**. 2015. 11th edition. W.H. Freeman and Co., New York
- Halford G. N. **Genetically modified crops**. 2012. Second Edition, Imperial College Press. London
- ISAAA 2016 **Global Status of Commercialized Biotech/GM Crops**. ISAAA Brief 52 <http://www.isaaa.org>
- Krebs J.E., Goldstein E.S., Kilpatrick S.T., **Lewin's Genes XII**. 2018. Jones and Bartlett Publishers. London
- Leng R.A. **Application of biotechnology to nutrition of animals in developing countries**. 1991. FAO ANIMAL PRODUCTION AND HEALTH PAPER 90.
- Mutch D.M., Wahli W and Williamson G (2005) **Nutrigenomics and nutrigenetics: the emerging faces of nutrition** The FASEB Journal 19: 1602-1616.
- Nelson G.C. **Genetically Modified Organisms in Agriculture**. 2001. Academic Press, London
- Renaville R. and Burny A. **Biotechnology in Animal Husbandry**. 2001. Kluwer Academic Publishers, Dordrecht, the Netherlands.
- Russell P.J. **iGenetics: A Molecular Approach**. 2009. Pearson; 3rd edition

Relevant Scientific Journals:

Animal Biotechnology  
 Animal Feed Science and Technology  
 Biotechnology Advances  
 BMC Biotechnology  
 Current Opinion in Biotechnology  
 EFSA Journal  
 The FASEB Journal  
 Genetics Selection Evolution  
 Journal of Animal Science  
 Journal of Animal Science and Biotechnology  
 Journal of Biotechnology  
 Livestock Science  
 PLoS ONE  
 Trends in Biotechnology

Lecture and Laboratory exercise notes are available on eclass