

Module of classes:

**APPLICATION OF ISOTOPES AND ANTIBODIES IN LABORATORY DIAGNOSTICS**

ECTS	5
Status	obligatory
Form of final credit	Exam
Requirements	basic knowledge in cell biology, physiology and biochemistry

**Field of study:**

**ANIMAL BIOENGINEERING**

Profile of study	General-academic
The code of the form of study and the level of study	master of thesis
Semester of study	summer
Language of study	English

**The leading faculty, department and the lecturer of the module:**

Name of the competent unit for the coordinator	Faculty of Animal Sciences, Department of Animal Physiology and Endocrinology
Course coordinator	Prof. dr hab. Andrzej Sechman

**Learning outcomes of the module/subject**

The code of the description component (symbol of the effect)	Description	Relation to (code)	
		field effect	discipline#

**KNOWLEDGE – the student knows and/or understands:**

AIP_W1	and defines the basic concepts and issues of nuclear physics: atom, isotope, radioactive decay, types of radiation, radiation measurement, radioactive series; has knowledge of the use of radioactive isotopes in laboratory techniques used in animal bioengineering	BIOI2_W04 BIOI2_W05	RZ
AIP_W2	the application of isotope-labeled inorganic and organic compounds in in vivo and in vitro tests	BIOI2_W05	RZ
AIP_W3	the meaning of key terms of immunology and interaction between the antigen-and antibody; explains methods of producing mono- and polyclonal antibodies and describes the methods of using these antibodies in diagnostic techniques	BIOI2_W04	RZ
AIP_W4	the basic laboratory methods and techniques that use antibodies and / or isotopes and indicates their use in biology, biotechnology and bioengineering of animals.	BIOI2_W04 BIOI2_W05	RZ

**SKILLS – the student can:**

AIP_U1	use radioactive isotopes and antibodies in in vitro and in vivo tests; perform some analyzes using radiolabelled substances and antibodies	BIOI2_U04	RZ
AIP_U2	determine the titre, cross-reactions and affinity of antibodies; uses the radioimmunological method (RIA) to determine the concentration of hormones in the blood plasma of animals and humans.	BIOI2_U07	RZ
AIP_U3	apply the immunohistochemical method in scientific research and diagnostics of cells and tissues; interprets the results of immunocytochemical analyzes	BIOI2_U04	RZ
AIP_U4	use the ELISA method in laboratory diagnostics; can determine concentration of a hormone in the blood using the ELISA method.	BIOI2_U04	
AIP_U5	perform western blot analysis to determine gene expression at the translation level; is able to isolate the protein, perform membrane transfer and use the appropriate antibody to detect the protein on the membrane	BIOI2_U04	RZ

**SOCIAL COMPETENCE- the student is ready to:**

AIP_K1	work in a group and lead a small team performing laboratory analyzes	BIOI2_K02	RZ
AIP_K2	take responsibility, risk and consequences of the use of radioactive substances in laboratory analysis.	BIOI2_K04	RZ
AIP_K3	comply with ethical principles in conducting animal experiments, performing laboratory analyzes and proper interpretation of test results.	BIOI2_K07	RZ

**Teaching content:**

<b>Lectures</b>		<b>20</b>	<b>hours</b>
Subjects of lectures	<p>Introduction – discussion concerning the basic problems of nuclear physics (radioactivity, dose of radioactivity, isotopes etc.) (2 h).</p> <p>Application of labelled preparations in vivo and in vitro (hormone kinetics, blood flow through the tissue, hormone uptake by the tissue, cell proliferation). (2 h)</p> <p>Principles of radioreceptorassay (RRA) – kinetics of radioligand assays, the Scatchard's plot. Application of the RRA method in biology and medicine (2 h)</p> <p>Overview basic concepts of immunology: antigen, antibody, characteristic antigen-antibody reaction; review of methods using isotopes and/or antibodies in laboratory diagnosis. Mono- and polyclonal antibodies - the characteristics and method of their production (2 h).</p> <p>Immunochemical methods (immunoassay techniques, labelling of antibodies, fluorescent and chemiluminescent methods). (2 h)</p> <p>Application of antibodies in selected techniques, Part I: ELISA, immunohistochemistry (4 h).</p> <p>Application of antibodies in selected techniques, Part II: Western blot, immunoprecipitation, immuno-PCR, EMSA (4 h).</p> <p>Radioimmunoassay (RIA) - the principle of the method, cross-reactivity of antibodies, the test of parallelism and recovery (2 h)</p>		
Realized learning outcomes	AIP_W1-W4; AIP_K2-K3		
Verification methods and criteria of effects evaluation	Written exam - the student answers 4 questions covering the most important issues discussed in lectures; for a positive grade the correct answer should be given to at least 3 questions; the share of the lecture grade in the final grade is 60%.		
<b>Classes (laboratories)</b>		<b>30</b>	<b>hours</b>
Subjects of the classes	<p>Immunocytochemistry: the localization of selected antigen in cells on paraffin sections of tissue (6 h)</p> <p>ELISA method: determination of hormones with the ELISA method and its application in laboratory diagnosis; determination of TSH levels in the animal or human blood plasma (6 h)</p> <p>Western blot: determination of protein expression in tissue homogenate; application of selected labelled antibody (6 h).</p> <p>Assessment of antibody properties: determination of titer and cross reactivity of antibodies applied to immunological method, the assessment of antigen-antibody affinity (6 h).</p> <p>RIA method: determination of thyroxine or triiodothyronine concentration in the animal or human blood plasma (6 h).</p>		
Realized learning outcomes	AIP_U1-U5; AIP_K1		
Verification methods and criteria of effects evaluation	Positive laboratory grades include individual laboratory exercises and answering final test questions; the share of the grade for laboratory exercises in the final grade is 40%.		
<b>Seminars</b>		<b>0</b>	<b>hours</b>
Subjects of the seminars	not applicable		
Realized learning outcomes	not applicable		
Verification methods and criteria of effects evaluation	not applicable		

**Literature:**

Basic	Rothfeld B.: Nuclear medicine in vitro, J.B. Lippincott Company, London, Mexico City, New York, St. Louis, Sao Paulo, Sydney, 1983. R.V. Lloyd, Morphology methods, Cell and Molecular Biology Techniques, Humana Press, Totowa, New Jersey, 2001. Ed Harlow, David P Lane: Antibodies: A Laboratory Manual, Cold Spring Harbor Laboratory Press, New York, 1988.
Supplementary	Publications in international scientific journals of the lecturer (see PubMed).

**Structure of learning outcomes:**

Discipline – animal husbandry and fishery (RZ)	5	ECTS*
Discipline –...	...	ECTS*

**Structure of student's activities:**

classes carried out with direct participation of the teacher	62	hours	2,5	ECTS*
including:				
lectures	20	hours		
classes and seminars	30	hours		
consultations	9	hours		
participation in research	0	hours		
mandatory practices and internships	0	hours		
participation in the exam and credits	3	hours		
classes carried out with the use of e-learning	0	hours	0	ECTS*
student's own work	63	hours	2,5	ECTS*

) \* - Reported to the nearest to 0,1 ECTS, where 1 ECTS = 25-30 hours of classes

) # discipline code: RZ - zootechnics and fishery, PB - biological sciences