



SZKOŁA GŁÓWNA  
GOSPODARSTWA  
WIEJSKIEGO

## Advanced imaging techniques

### Educational subject description sheet

#### Basic information

<b>Field of study</b> Veterinary Medicine	<b>Didactic cycle</b> 2023/24	
<b>Speciality</b> -	<b>Subject code</b> WETFVMS_D.580K.01734.23	
<b>Organizational unit</b> Faculty of Veterinary Medicine	<b>Lecture languages</b> english	
<b>Study level</b> long-cycle	<b>Mandatory</b> Obligatory subjects	
<b>Study form</b> full-time studies	<b>Block</b> Major subjects	
<b>Education profile</b> General academic	<b>Disciplines</b> Veterinary medicine	
<b>Coordinator</b>	Zdzisław Gajewski, Maria Sady	
<b>Teacher</b>	Zdzisław Gajewski, Maria Sady, Romuald Zabielski, Karolina Ferenc, Jarosław Olszewski, Piotr Matyba, Arkadiusz Szterk, Sylwia Flis, Krystyna Żyżyńska-Galeńska, Artur Jabłoński, Aleksandra Piecuch	
<b>Period</b> Semester 8	<b>Examination</b> Pass with grade	<b>Number of ECTS points</b> 2
	<b>Activities and hours</b> Lecture: 8 Ćwiczenia kliniczne: 22	

#### Goals

Code	Goal
C1	The aim is to acquire and consolidate skills such as conducting acute and chronic experiments, pharmacological anesthesia, surgical operations, collecting biological material, performing terminal procedures.

## Entry requirements

Topographic anatomy, Diagnostic imaging of large animals, Diagnostic imaging of small animals, Animal physiology 2, Biophysics, Pathophysiology, Veterinary pharmacology 2, General surgery and anesthesiology, Clinical and laboratory diagnostics 2, Pathomorphology

## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
<b>Knowledge - Student knows and understands:</b>			
W1	the physical interactions used in modern imaging methods;	B.W4, B.W6	Written credit
W2	the principles of preparing the patient for imaging studies under general anesthesia	B.W4, B.W5	Written credit
W3	the principles and safety procedures during the CT examination, including the use of contrast agents	B.W4, B.W5	Written credit
W4	the rules and procedures of safety during the MRI examination, including the use of contrast agents;	B.W4, B.W5	Written credit
W5	the rules and procedures of safety during the PET/MR examination, including the use of contrast agents and radioactive isotopes;	B.W4, B.W6	Written credit
W6	the rules and safety procedures during angiographic, endoscopic and ultrasound examinations;	B.W4, B.W6	Written credit
<b>Skills - Student can:</b>			
U1	conduct an interview and a clinical examination focused on the selection or exclusion of the use of modern imaging techniques;	B.U1, B.U2, B.U3	Written credit
U2	choose a modern imaging technique to the clinical situation;	B.U7	Written credit
U3	prepare the patient for CT, MRI, PET/MR examinations;	B.U7	Written credit
U4	evaluate the basic results of CT, MRI, PET/MR examinations;	B.U20	Written credit
<b>Social competences - Student is ready to:</b>			
K1	choose a modern imaging technique based on specialist knowledge;	KS.1, KS.2, KS.5	Written credit
K2	evaluation of his knowledge and the benefits of using modern imaging techniques;	KS.4, KS.8	Written credit
K3	lifelong learning and is ready to deepen his knowledge using scientific sources;	KS.3, KS.5, KS.6, KS.7, KS.9	Written credit

## Study content

No.	Course content	Subject's learning outcomes	Activities
1.	<p>The aim of the course is to familiarize students with new imaging techniques of physiological and pathological changes occurring in the organisms of companion animals, horses and experimental animals. Radiology, as one of the most dynamically developing fields of medicine, offers veterinarians a number of modern tools significantly expanding diagnostic possibilities. The aim of the course is also to show students the quantity and quality of data obtained in modern imaging, compared to traditional USG and X-ray examination, and thus the scope of required knowledge and skills. The aim of the course is to prepare students for the right choice of modern imaging techniques and the possibilities of clinical applications through active participation in imaging studies performed using the latest technical solutions. Such an opportunity, as the only one in Poland, is provided by the unique infrastructure and equipment of the Biomedical Research Center and the Center for Regenerative Medicine of the Warsaw University of Life Sciences, with, among others, CT, DE CT, MRI, DWI MRI, MRg-FUS, PET-MR and top-class angiography, endoscopy and ultrasound. The aim is to acquire and consolidate skills such as conducting acute and chronic experiments, pharmacological anesthesia, surgical operations, collecting biological material, performing terminal procedures.</p> <p>The content of the lectures is the theoretical basis for the training content of the exercises, the main purpose of which is the practical preparation, performance and evaluation of research conducted using modern imaging techniques.</p> <p>Lectures (8 hrs):</p> <ol style="list-style-type: none"> <li>1. Computed tomography (CT) imaging - basics of imaging, clinical applications</li> <li>2. Magnetic Resonance Imaging (MRI) Magnetic Resonance Guided Focused Ultrasound (MRg-FUS) imaging and therapy - imaging basics, clinical applications</li> <li>3. Imaging by Positron Emission Tomography with Magnetic Resonance (PET-MR) and a digital system for angiographic examinations - basics of imaging, clinical applications</li> <li>4. Imaging using modern endoscopic techniques (3D endoscopy, cystoscopy) and ultrasound (3D ultrasonography, elastography) - basics of imaging, clinical applications</li> </ol>	W1, W2, W3, W4, W5, W6, U1, U2, U3, U4, K1, K2, K3	Lecture

No.	Course content	Subject's learning outcomes	Activities
2.	Clinical exercises (22 hrs): 1. Preparation, conduct and evaluation of the results of the computed tomography (CT) examination 2. Preparation, conduct and evaluation of the results of the computed tomography (CT) examination with the use of contrast agents 3. Preparation, conduct and evaluation of the results of magnetic resonance imaging (MRI) and Magnetic Resonance Guided Focused Ultrasound (MRg-FUS) - cancer therapy 4. Preparation and evaluation of the results of the Positron Emission Tomography with Magnetic Resonance (PET-MR) examination 5. Preparation, conduct and evaluation of examination results using a digital system for angiographic examinations 6. Preparation, conduct and evaluation of examination results using modern endoscopic techniques 7. Preparation, conduct and evaluation of examination results using modern ultrasound techniques	W1, W2, W3, W4, W5, W6, U1, U2, U3, U4, K1, K2, K3	Ćwiczenia kliniczne

### Course advanced

Activities	Methods of conducting classes
Lecture	Case study, Discussion, Simulation games, Presentation, Problem solving, Repetitive method
Ćwiczenia kliniczne	Conversation lecture, Case study, Discussion, Simulation games, Presentation, Problem solving, Analysis of source materials, Repetitive method

Activities	Examination method	Percentage
Lecture	Written credit	60%
Ćwiczenia kliniczne	Written credit	40%

Activities	Credit conditions
Lecture	The following elements and their weights affect the final grade in the subject: - grade from the colloquium (40% of the final grade), - exam grade (60% of the final grade); The maximum number of points to be obtained from all elements of the assessment: 100. The assessment is given according to the given criteria - points/grade: <51 - 2; 52-60 - 3, 61-70 - 3+, 71-80 - 4; 81-90 - 4+; >91 - 5.
Ćwiczenia kliniczne	The following elements and their weights affect the final grade in the subject: - grade from the first colloquium (20% of the final grade), - grade from the second colloquium (20% of the final grade), The maximum number of points to be obtained from all elements of the assessment: 100. The assessment is given according to the given criteria - points/grade: <51 - 2; 52-60 - 3, 61-70 - 3+, 71-80 - 4; 81-90 - 4+; >91 - 5.

## Literature

### Obligatory

1. Schwarz T., Saunders J. (2011) Veterinary Computed Tomography 1st Edition, Kindle Edition, Wiley-Blackwell
2. Wisner E., Zwingenberger A. (2015) Atlas of Small Animal CT and MRI 1st Edition, Kindle Edition, Wiley-Blackwell
3. Textbook of Veterinary Diagnostic Radiology Book • Seventh Edition • 2018

### Optional

1. Atlas of Small Animal CT and MRI Authors: Eric Wisner Allison Zwingenberger Brand: John Wiley and Sons ISBN: 9781118446171
2. Wilfried Mai Diagnostic MRI in Dogs and Cats Taylor & Francis Inc, 2018
3. Lavin's Radiography for Veterinary Technicians - E-Book 6th Edition, Kindle Edition by Marg Brown (Author), Lois Brown (Author)
4. Atlas of Small Animal Ultrasonography 2nd Edition, Kindle Edition by Dominique Penninck (Editor), Marc-André d'Anjou (Editor)
5. Veterinary Image-Guided Interventions 1st Edition by Chick Weisse (Editor), Allyson Berent (Editor)

## Calculation of ECTS points

Activity form	Activity hours*
Lecture	8
Ćwiczenia kliniczne	22
Preparation for the exam	15
Preparation for the test	15
<b>Student workload</b>	<b>Hours</b> 60
<b>Number of ECTS points</b>	<b>ECTS</b> 2

\* hour means 45 minutes

## Effects

Code	Content
KS.1	label.effect.prefix.competenceAbsolwent jest gotów do wykazywania odpowiedzialności za podejmowane decyzje wobec ludzi, zwierząt i środowiska przyrodniczego
KS.2	label.effect.prefix.competenceAbsolwent jest gotów do prezentowania postawy zgodnej z zasadami etycznymi i podejmowania działań w oparciu o kodeks etyki w praktyce zawodowej oraz do wykazywania tolerancji dla postaw i zachowań wynikających z odmiennych uwarunkowań społecznych i kulturowych
KS.3	label.effect.prefix.competenceAbsolwent jest gotów do udziału w rozwiązywaniu konfliktów, a także wykazywania się elastycznością w reakcjach na zmiany społeczne
KS.4	label.effect.prefix.competenceAbsolwent jest gotów do korzystania z obiektywnych źródeł informacji
KS.5	label.effect.prefix.competenceAbsolwent jest gotów do formułowania wniosków z własnych pomiarów lub obserwacji
KS.6	label.effect.prefix.competenceAbsolwent jest gotów do formułowania opinii dotyczących różnych aspektów działalności zawodowej
KS.7	label.effect.prefix.competenceAbsolwent jest gotów do rzetelnej samooceny, formułowania konstruktywnej krytyki w zakresie praktyki weterynaryjnej, przyjmowania krytyki prezentowanych przez siebie rozwiązań, ustosunkowywania się do niej w sposób jasny i rzeczowy, także przy użyciu argumentów odwołujących się do dostępnego dorobku naukowego w dyscyplinie
KS.8	label.effect.prefix.competenceAbsolwent jest gotów do pogłębiania wiedzy i doskonalenia umiejętności
KS.9	label.effect.prefix.competenceAbsolwent jest gotów do komunikowania się ze współpracownikami i dzielenia się wiedzą
B.U1	label.effect.prefix.skillAbsolwent potrafi bezpiecznie i humanitarnie postępować ze zwierzętami oraz instruować innych w tym zakresie
B.U2	label.effect.prefix.skillAbsolwent potrafi przeprowadzić wywiad lekarsko-weterynaryjny w celu uzyskania dokładnej informacji o pojedynczym zwierzęciu lub grupie zwierząt oraz jego lub ich środowisku bytowania
B.U3	label.effect.prefix.skillAbsolwent potrafi przeprowadzać pełne badanie kliniczne zwierzęcia
B.U7	label.effect.prefix.skillAbsolwent potrafi stosować aparaturę diagnostyczną, w tym radiologiczną, ultrasonograficzną i endoskopową, zgodnie z jej przeznaczeniem i zasadami bezpieczeństwa dla zwierząt i ludzi oraz interpretować wyniki badań uzyskane po jej zastosowaniu
B.U20	label.effect.prefix.skillAbsolwent potrafi korzystać ze zgromadzonych informacji związanych ze zdrowiem i dobrotanem zwierząt, a w wybranych przypadkach również z produktywnością stada
B.W4	label.effect.prefix.knowledgeAbsolwent zna i rozumie zasady postępowania diagnostycznego, z uwzględnieniem diagnostyki różnicowej, oraz postępowania terapeutycznego
B.W5	label.effect.prefix.knowledgeAbsolwent zna i rozumie zasady przeprowadzania badania klinicznego i monitorowania stanu zdrowia zwierząt
B.W6	label.effect.prefix.knowledgeAbsolwent zna i rozumie sposób postępowania z danymi klinicznymi i wynikami badań laboratoryjnych i dodatkowych