Module code	M_WE_ SEM7 PW 1E/2E HEMAT
Field of study	Veterinary medicine
Module name	Laboratory Haematology Hematologia laboratoryjna
Language of instruction	English
Module type	elective
Level of studies	Long-cycle Master's Degree studies
Mode of study	Full-time
Year of study in the field of study	IV
Semester of study in the field of study	VII
ECTS credits, divided into contact/non-contact hours	1 (0.6/0.4)
Academic title/degree, name of the person responsible for the module	Dr. Andrzej Milczak
Unit teaching the module	Department and Clinic of Internal Animal Diseases, Faculty of Veterinary Medicine in Lublin
Module objective	The aim of the course is to familiarize students with the issues of specialized hematological laboratory diagnostics, blood preparation and quality control in a veterinary diagnostic laboratory.
The learning outcomes for the module include a description of the knowledge, skills and social competences that the student will gain after completing the module.	Knowledge:
	K1. knows the basic problems of pre-laboratory and post-laboratory phases of hematological examinations and the guidelines for transport, storage and preparation of biological material for analysis
	K2. knows factors affecting the reliability of hematology test results and the principles of quality control of laboratory tests and how to document it
	K3. knows methods of laboratory assessment of hematopoietic disorders in the aspect of morphological and functional changes and mechanisms of disease development
	Skills:
	S1. is able to assess the suitability of biological material for testing, store it and prepare for analysis, following the principles of Good Laboratory Practice
	S2. is able to use both simple and technically advanced medical equipment and apparatus, observing the principles of their use and maintenance and perform - using manual and automatic methods - haematological and coagulological tests
	S3. is able to apply procedures for the validation of measuring apparatus and test methods in accordance with the principles of quality control and to conduct and document intra-laboratory and extra-laboratory quality control of laboratory tests
	Social competences:
	C1. is able to communicate with recipients of laboratory test results
	C2. has the ability to work in a team of specialists, in a multicultural and multinational environment

	C3. applies the principles of professional collegiality and cooperation with representatives of other medical professions
Prerequisites and additional requirements	According to the sequence of subjects

Module programme content	Each exercise lasts 1 lesson hour 1. Hematology laboratory organization. Legal status of analytical laboratories. Principles of laboratory accreditation. (tutorials) 2. Principles of collecting samples for tests - blood. Collection of venous and capillary blood. Blood collection systems. Types of anticoagulants. Material storage conditions. Preparation of blood samples for coagulological and serological tests. Causes of the most common pre-laboratory errors. (tutorials) 3. Principles of collecting samples for tests of the hematopoietic system - marrow, lymph nodes. Principles and methodology of bone marrow collection - fine needle biopsy, trepanobiopsy. Fine needle aspiration biopsy of lymph nodes. Collection of lymph nodes for histological examination. 4. Morphological blood tests - cell counts, red blood cell indices. Analytical methods and automation of blood morphology tests. Performance of blood morphology tests on hematology analyzers. 5. Morphological blood tests - smear. Evaluation of normal and pathologic blood smears. Techniques for the preparation and staining of blood and marrow cytological slides. Assessment of hematopoietic efficiency - methods for determining reticulocyte percentage. Interpretation Myelogram evaluation 6. Laboratory tests in the diagnosis of anemia. Interpretation of blood count results. Key tests in the differentiation of hemolytic syndromes.. 7. Laboratory tests in the diagnosis of lymphoma, leukemia, and myelodysplastic syndromes. Interpretation of blood morphology, myelogram and lymph node biopsy results Theoretical assumptions and methodology of cytochemical and cytoenzymatic studies. 8. Immunophenotyping of blood and hematopoietic cells. Cell surface receptors of the hematopoietic system. Flow cytometry in hematologic diagnosis. (tutorials) 9. Laboratory monitoring in the course of treatment of hematologic syndromes. Urgent conditions in hematology - selection of indicators assessed. 10. Examinations of the haemostatic system. Tests to assess the efficiency of hemostasis. Determination of PT/ INR, APTT, fibrinogen, fibrinolysis time, DD, clot retraction, clotting factors, anticoagulant detection. 11. Diagnosis of hemorrhagic diathesis and thromboembolic processes. Selection of laboratory tests. Interpretation of coagulologic test results. Laboratory diagnosis of DIC syndrome. (tutorials) 12. Serological tests in hematology. Blood types in animals. Determination of major group antigens. Cross-connection test Diagnosis of immunohemolytic anemias. 13. Blood and blood products. Types of blood products. Blood preparation. Storage conditions and shelf life of blood products. (tutorials) 14. Quality control. Principles of performing external and intra-laboratory quality control of hematology tests. 15. Receiving credit for the course

List of core and supplementary literature	Core literature Kenneth S. Latimer: Duncan and Prasse's Veterinary Laboratory Medicine: Clinical Pathology 5th Edition Willey Blackwell 2021 John W. Harvey: Veterinary Hematology: A Diagnostic Guide and Color Atlas. Elsevier Inc. 2012 Supplementary literature: Martinem de Merlo. E. M.: Atlas de citologia clinica del perro y del gato. SERVET, Zaragoza 2008 John W. Harvey: Atlas of Veterinary Hematology: Blood and Bone Marrow of Domestic Animals 1st Edition, Saunders 2000 Amy C. Valenciano: Cowell and Tyler's Diagnostic Cytology and Hematology of the Dog and Cat. 5th Edition, Elsevier Inc. 2020 William J. Reagan: Veterinary Hematology: Atlas of Common Domestic and Non-Domestic Species. 3rd ed. Wiley-Blackwell 2019 Reinhard Mischke: Praktische Hämatologie bei Hund und Katze. 1. Auflage, Schlütersche 2002 Ilse Schwendenwein, Andreas Moritz: LaborSkills: Leitfaden Labordiagnostik für Hund und Katze. Thieme 2019
Planned forms/activities/teaching methods	Lecture with multimedia presentation, elements of academic tutoring (case study). Method of didactic games - elements of drama - applies to tutorials. Experiential learning model, teaching microscopy skills, operation of hematology and coagulometry analyzers, manual procedures, interpretation of laboratory test results.

<table>
<tr><td>Verification methods and ways of documenting the achieved learning outcomes.</td><td>

K1 - K3 - final assessment test. The final test to earn credit includes the exercise material and additional issues made available to students at the beginning of the semester. The test consists of 30 questions. A student may earn between 18 and 30 credit points.
S1 - S3 - performance of the practical task assessed on the basis of a written report drawn up after each exercise. Report forms are made available to students at the beginning of each exercise and reviewed no later than 2 weeks prior to the date of end-of-term examinations. Each of the 14 reports is rated on a scale of 0 to 5 credit points. Reports for which the student has received 0 credit points. should be corrected within 2 weeks. The average score for all reports submitted is considered for evaluation
C1 - C3 - point assessment of the student's work in a team during exercises. During each exercise, the student's work is subject to evaluation (involvement in the research, diligence, cooperation with other group members). A student may earn between 0 and 2 credit points.

The final grade is determined by the sum of the points obtained from the final credit, report evaluation and student's work evaluation: 20 - 22 points - sufficient; 23 - 27 points - sufficient+; 28 - 33 points - good; 34 - 35 good+; >35 – very good.
</td></tr>
<tr><td>ECTS credits</td><td>
<table>
<tr><td colspan="3">CONTACT</td></tr>
<tr><td></td><td>Hours</td><td>ECTS</td></tr>
<tr><td>Practical classes</td><td>14</td><td>0.56</td></tr>
<tr><td>colloquium in practical classes</td><td>1</td><td>0.04</td></tr>
<tr><td>TOTAL contact hours</td><td>15</td><td>0.6</td></tr>
<tr><td colspan="3">NON-CONTACT HOURS</td></tr>
<tr><td>preparation for classes</td><td>6</td><td>0.24</td></tr>
<tr><td>learning from books</td><td>4</td><td>0.16</td></tr>
<tr><td>TOTAL non-contact hours/ ECTS credits</td><td>10</td><td>0.4</td></tr>
</table>
</td></tr>
<tr><td>The workload of activities that require direct participation of an academic teacher</td><td>
<table>
<tr><td>attendance at practical classes</td><td>14</td><td>0.56</td></tr>
<tr><td>written credit for exercises</td><td>1</td><td>0.04</td></tr>
<tr><td>TOTAL of practical character</td><td>21</td><td>0.6</td></tr>
</table>
</td></tr>
<tr><td>Relation of module learning outcomes to major learning outcomes</td><td>K1 - WE_W21 +++,
K2 - WE_W16 +++, WE_W21 +++, WE_W19 +++;
K3 - WE_W17 +++, WE_W16 +++;
S1 - WE_U19 ++;
S2 - WE_U19 ++, WE_U20 ++;
S3 - WE_U20 ++, WE_U19 ++;
C1 - WE_K1;
C2 - WE_K3 +;
C3 - WE_K9 +</td></tr>
<tr><td>Elements and values affecting final grade</td><td>

Final test score - 48 - 81%
Performance of the practical task - 0 - 13.5%
Point evaluation of the student's teamwork during exercise performance - 0 - 5.5%

The minimum score must not be less than 54%.
</td></tr>
</table>