



TOTAL per year: 10

Educational objectives (max. 6 items)

- C1.** To familiarize students with major methods used in immunohistochemistry (IHC), which are routinely used in morphological examination and histopathological diagnosis and with the principle of transmission electron microscope (TEM) operation.
- C2.** To familiarize students with IHC reactions and their results showing the correct structure of cells and tissues, and tumor specific antigens applicable in the differential diagnosis of benign and malignant neoplasms.
- C3.** To familiarize students with the process of preparing biological material for IHC reactions and methods of evaluating their results.
- C4.** To familiarize students with the method of preparing research material for TEM and the possibilities of using this method in the evaluation of cells and tissues ultrastructure and in clinical diagnostics (the so called ultrastructural pathology).
- C5.** To familiarize students with typical ultrastructural images of normal and pathological cells

Education result matrix for module/course in relation to verification methods of the intended education result and the type of class

Number of course education result	Number of major education result	Student who completes the module/course knows/is able to	Methods of verification of intended education results (forming and summarising)	Form of didactic class <i>**enter the abbreviation</i>
W 01	A. W4.	The student knows basic cellular structures and their functional specializations	Oral response	LC
W 02	B. W34.	The student knows the principles of scientific, observational and experimental research	Oral response	LC
W 03	B. W34.	The student knows the equipment of IHC and TEM laboratories and basic reagents	Oral response	LC
W 04	B. W34.	The student possesses the necessary knowledge of biological material preparation for the IHC reaction and TEM examination	Activity in the discussion	LC
W 05	C. W25.	The student operates fluently the pathological nomenclature	Activity in the discussion	LC
W 06	C. W30.	The student explains the basic issues in the field of detailed ultrastructural pathology of organs and microscopic images	Oral response	LC
U 01	A. U2.	The student recognizes the cellular structure in the electron microscope images, makes a description and interprets their structure and the relationship between the structure and function	Oral response	LC
U 02	C. U8.	The student uses the antigen - antibody reaction in current modifications and techniques for the diagnosis of cancer	Presentation	LC
U 03	C. U8	Student is able to prepare biological material for research in TEM	Presentation	LC
U 04	C. U8	Student is able to make a basic assessment of the results of IHC reactions and images in TEM (electronograms)	Oral response	LC

** L - lecture; SE - seminar; AC – auditorium classes; MC – major classes (non-clinical); CC – clinical classes; LC – laboratory classes; SCM – specialist classes (magister studies); CSC – classes in simulated conditions; FLC – foreign language course; PCP practical classes with patient; PE – physical education (obligatory); VP – vocational practice; SS – self-study, EL – E-learning .

Please mark on scale 1-5 how the above effects place your classes in the following categories:

communication of knowledge, skills or forming attitudes:

Knowledge: 5



Skills: 3	
Student's amount of work (balance of ECTS points)	
Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	10
2. Student's own work (self-study):	3
Total student's workload	13
ECTS points for module/course	0.5
Comments	
Content of classes (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)	
Lectures not applicable	
Seminars not applicable	
Practical classes Laboratory classes (LC) I Immunohistochemistry methods (IHC, 5 hours) 1. Markers used in immunohistochemical methods. 2. Preparation of material for the IHC reaction (tissue fixation, paraffin sections obtaining). 3. Antibodies - characteristics, production, detection. 4. Types and selection of immunohistochemical reactions with special methods (avidin-biotin system). 5. Examples of applied stainings, evaluation of reaction, methodological problems in IHC and their solutions. 6. Immunohistochemistry in the diagnosis and histogenesis of tumors (selection of chemical reactions, the role of immunohistochemistry in determining the origin of the tumor markers specific for certain types of cancer, the importance of the results of immunohistochemistry in determining the prognostic and predictive factors of some cancers). 7. Performance of exemplary IHC reaction. 8. Evaluation of slides. II Transmission electron microscopy (TEM, 5 hours) 1. The construction and principle of operation a transmission electron microscope. 2. Preparation of samples for study (obtaining, dual fixation method, dehydration and embedding material in the epoxy resin). 3. Performing semithin sections and staining them with toluidine blue. 4. Epon blocks trimming. 5. Demonstration of ultra-thin sections cutting with diamond knife. 6. Counterstaining, the principle of image formation in the TME. 7. Observation of selected cells in TME and discuss their ultrastructure, documentation design in the form of electronograms. 8. The ultrastructural basis of selected diseases.	
Other not applicable	
Basic literature (list according to importance, no more than 3 items) 1. Junqueira's Basic Histology Text and Atlas. The McGraw-Hill Companies, 2016r. 2. B. Young, J. S. Lowe, A. Stevens, J. W. Heath. Wheater,s functional histology A text and Colour Atlas.	



Churchill Livingstone Elsevier, 2006r.

Additional literature and other materials (no more than 3 items)

1. N. F. Cheville. Ultrastructural Pathology. The comparative cellular basis of disease. Wiley-Blackwell, 2009r.
2. A. M. Dworak, R. A. Monahan-Earley. Diagnostic Ultrastructural Pathology I. CRC Press, 1992r.
3. M. A. Hayat. Principles and techniques of Electron Microscopy Van Nostrand Reinhold Company, 1973r.

Didactic resources requirements (e.g. laboratory, multimedia projector, other...)

Laboratory, fume hood, Autostainer Link 48, optical microscope, transmission electron microscope Jeol JEM 1011, ultramicrotome, laboratory desks, laboratory glass, IHC and TEM reagents, seminar room, multimedia projector.

Preliminary conditions (minimum requirements to be met by the student before starting the module/course)

lack

Conditions to receive credit for the course (specify the form, criteria and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be met by the student to pass it and criteria for specific grades).

- Active participation in the discussion during each class.
- Presence in all classes. Each absence must be made up, including rector's days or dean's hours. The student is required to pass material from canceled classes in a form agreed with the teacher (e.g. presentation, oral answer).
- For each grade, the student needs to meet the following criteria defined below:

Grade:	Criteria for course
Very Good (5.0)	Student makes documentation in the form of electronograms with the usage of a transmission electron microscope. The student knows the possibilities of using TEM method in the evaluation of cells and tissue ultrastructure and in clinical diagnostics (ultrastructural pathology). The student makes a presentation on a given subject.
Good Plus (4.5)	The student is able to make a basic assessment of the results of IHC reactions and describes electronograms of normal and pathological cells in TEM. The student knows the ultrastructural basis of selected diseases and the principle of TEM operation. Students make in pairs the presentation on a given subject.
Good (4.0)	Student knows tumor-specific antigens applicable in the differential diagnosis of benign and malignant neoplasms and the role of IHC in determining the origin of specific types of cancer. The student recognizes the cellular structure in the typical ultrastructural images (electronograms) and makes descriptions and interprets their structure and the relationship between the structure and function. Students make in pairs the presentation on a given subject.
Satisfactory Plus (3.5)	Student knows the major types of immunohistochemical reactions (IHC). The student knows basic cellular structures and their functional specializations.
Satisfactory (3.0)	Student possesses the necessary knowledge of biological material



	preparation for the IHC reaction and TEM examination (embedding in epoxy resin). Student knows the equipment of immunohistochemistry (IHC) and transmission electron microscopy (TEM) laboratories and basic reagents.

Name of unit teaching course:	Division of Histology and Embryology, Department of Human Morphology and Embryology
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Person responsible for course:	Prof. Dr hab. n. med. Paweł Surowiak
Phone	+48 71 784 13 54
E-mail	Pawel.surowiak@interia.pl

<i>List of persons conducting specific classes:</i>	<i>degree/scientific or professional title</i>	<i>Discipline</i>	<i>Performer profession</i>	<i>Form of classes</i>
Paweł Surowiak	Prof	Medicine – medical biology	MD	laboratory classes
Katarzyna Haczkiwicz-Leśniak	PhD	Medicine – medical biology	biologist	laboratory classes

Date of Syllabus development

15.07.2019r.

Syllabus developed by

Uniwersytet Medyczny we Wrocławiu
ZAKŁAD HISTOLOGII I EMBRIOLOGII
prof. Paweł Surowiak

prof. dr hab. Paweł Surowiak

Signature of Head of teaching unit

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