

SYLLABUS

The academic year when the cycle of instruction is commenced 2021-2027

Module/course name:	Biochemistry and Molecular Biology	Module code	LK.3.013
Faculty:	Faculty of Medicine		
Major:	Medical		
Specialty:			
Level of study:	I (Bachelor studies) <input type="checkbox"/> II (Master studies) <input type="checkbox"/> Integrated Master studies X Doctoral studies <input type="checkbox"/>		
Mode of study:	full-time X		
Year of study:	I <input type="checkbox"/> II X III X IV <input type="checkbox"/> V <input type="checkbox"/> VI <input type="checkbox"/>	Semester:	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 X 5 X 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/>
Module/course type:	obligatory X elective <input type="checkbox"/>		
Language of instruction:	Polish <input type="checkbox"/> English X		
Form of education	Hours		
Lecture	18		
Seminar	36		
Laboratory class	96		
E-learning	e-lecture, e-seminar		
Practical class			
Internship			
Other			
TOTAL	150		
Student's work input (participation in class, preparation, evaluation, etc.)	Student's hourly workload		
1. In class	150		
2. Student's own work including: 1 Preparation for class 2 Preparation for partials and finals	240		
Summary of the student's workload	390		
ECTS points for module/course	13		

Educational objectives:

Students are expected to know by the end of the biochemistry and molecular biology course:

Structures and physiological functions of amino acids, peptides, proteins, carbohydrates, lipids, nucleic acids existing in the human organism.

Mechanisms and kinetics of enzymes activity. Types of enzymes. Diagnostic significance of enzymes.

Processes of biological oxidation and their regulation.

Metabolic pathways by which human organisms use or degrade amino acids, peptides, proteins, carbohydrates, lipids, nucleic acids. The main regulation of them and connected disorders.

Mechanisms of extracellular and intracellular communications between tissues and organs of the human organism integrated with acquired knowledge connected to hormone, enzyme and cytokine function.

Nutrition. The process of digestion and absorption of food components and disorders.

Types of vitamins and minerals and their influence on the general metabolism of the human body and symptoms occurring in cases of their deficiencies or excesses.

Biochemistry of plasma proteins, red blood cells, the kidneys and the liver.

Lab classes are good opportunity for acquiring the knowledge about different methods and equipment used in biochemistry and

The matrix of learning outcomes for module/ subject with reference to verification methods of the intended educational outcomes and forms of instruction:

Learning outcome code	A student who has obtained a credit for the module/course has the knowledge/skill to:	Methods of verifying the achievement of the intended learning outcomes:	Form of instruction * provide the symbol
*L- lecture; e-L- e-lecture; S- seminar, e-S- e-seminar; Lab- lab class			
B.W2	describes acid-base equilibrium and buffer action mechanism as well as their significance in systemic homeostasis;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W11	describes the structure of lipids and polysaccharides and their function in cellular and extracellular structures;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W12	describes primary, secondary, tertiary and quaternary protein structures, knows posttranslational and functional protein modifications and their significance;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W13	knows the function of nucleotides in a cell, primary and secondary structures of DNA and RNA and chromatin structure;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W14	knows the function of human genome, transcriptome and proteome and basic methods applied in their studies; describes the processes of replication, repair and recombination of DNA, transcription and translation and degradation of DNA, RNA and proteins; knows the concept of gene expression control;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W15	describes basic katabolic and anabolic pathways, methods of their control and the effect of genetic and environmental factors;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W16	knows the metabolic profiles of basic organs and systems;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W17	knows the methods of intercellular communication, communication between a cell and extracellular matrix and the signal transmission paths in a cell as well as examples of disturbances in these processes, leading to development of cancers and other diseases;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.W 19	has basic knowledge on stem cells and their application in medicine	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
C.W42	knows the basic trends in the development of therapy, in particular, the possibilities offered by cellular, genetic and targeted therapy in specific diseases;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab

C.W47	knows the concepts of: system oxidation potential and oxidation stress;	Oral exam.Written exams: MCQ,true/false test	e-L; e-S; Lab
C.W48	knows the consequences of vitamins or minerals deficiency and excess;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
C.W49	knows enzymes taking part in digestion process, mechanism of hydrochloric acid production in the stomach, the role of bile, the course of digestive products absorption and disorders related to it;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
C.W 50	knows the consequences of an inappropriate feeding like: prolonged fasting, too “big meals” and unbalanced diet	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
C.W.51	knows the mechanism of hormonal activity	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
E.W39	knows the types of biological materials used in laboratory diagnostics and the principles of specimen collection;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.U6	can predict the direction of biochemical processes depending on the cell energetic status;	Oral exam.Written exams: MCQ, true/false test	e-L; e-S; Lab
B.U8	makes use of basic laboratory techniques, such as qualitative analysis, titration, calorimetry, pH metry, chromatography, protein and nucleic acid electrophoresis ;	The completion of a given assignment; project, lab report	Lab
B.U13	can plan and carry out simple research study, interpret the results and draw conclusions.	Performed on laboratory classes.	Lab
K01	can perform properly and prepare a well-documented report from the results of laboratory classes;	Oral and written reports, essays, completion of a given assignment	Lab
K02	an active participation in lab classes, willingly undertaking and performing additional tasks entrusted by a teacher conducting classes;	An extended observation by a supervisor/ tutor.	Lab
K03	showing the ability to work in a team, responsibility for the safety of one's own work and colleagues.	An extended observation by a supervisor/ tutor.	Lab

EXAMPLES OF METHODS VERIFYING THE ACHIEVEMENT OF THE INTENDED LEARNING OUTCOMES:

In terms of knowledge: Oral exam (*non-standardized, standardized, traditional, problem-based*).

Written exam – the student produces/identifies answers)*essay, report; structured short-answer questions /SSQ/; multiple choice questions /MCQ/; multiple response questions /MRQ/; matching test; true/false test; open cloze test*)

In terms of skills: practical exam; Objective Structured Clinical Examination /OSCE/; Mini-CEX (mini – clinical examination); completion of a given assignment; project, presentation.

In terms of social competences:

A reflective essay; an extended observation by a supervisor/tutor; 360-degree assessment (feedback from teachers, peers, patients, other co-workers); self-assessment (portfolio included).

Course content: (use keywords referring to the content of each class following the intended learning outcomes):

Lectures (L) –e-lectures:	(semester 1 and 2) - 18 hours; 4 lectures / semester
Laboratory classes (Lc):	(semester 1 and 2) - 96 hours; 12 lab classes / semester
Seminars (S) - e-seminars:	(semester 1 and 2) - 36 hours; 6 seminars / semester

I semester

1st week

L - 1.Amino acids, peptides and proteins + Introduction for subject (3 h)

Biological values of amino acids, peptides and proteins .The primary structure of polypeptide chain and the characterization of peptide bonds. Examples of biologically active peptides. Structures, functions and types of globular and fibril proteins in the human organism.

Lc - 1 Isolation of proteins from cancer cells. Quantitative determination of protein content by the Bradford's method. (4h)

2nd week

Lc -2 Quantitative determination of glutathione (4h)

3rd week

Lc – 3 Protein analysis by the Western blotting technique .Immunodetection. (4h)

Seminar 1- Properties of proteins. Posttranslational modifications of polypeptides and proteins. Inhibitors of protein biosynthesis. Protein folding. Problems with proper protein conformation. The repetition – amino acids, peptides and proteins (3h)

4th week

L - 2. Enzymes.(2h)

Enzyme definition, structure and features. International classification of enzymes. Structures, general properties of coenzymes and cofactors. Coenzymes. Mechanisms of enzyme action, substrate specificity, factors affecting reaction velocity, kinetics of an enzyme-catalyzed reaction, inhibition of enzyme activity, regulation of enzyme activity. Isoenzymes. Enzymes in clinical diagnosis.

Lc - 4 Evaluation of K_m and V_{max} for succinate dehydrogenase.(4h)

5th week

Lc - 5 Assay of succinate dehydrogenase activity. Detection of enzymatic activities of phenolase, peroxidase and catalase in extract from potato. (4h)

6th week

Lc -6 Assay for determination of lactate dehydrogenase in serum or plasma. (4h)

Seminar 2 - Energy-producing and energy-utilizing systems. Energy-rich compounds. The tricarboxylic acid cycle. Transport systems by the inner mitochondrial membrane, The electron transfer chain and oxidative phosphorylation. The uncoupling agents and inhibitors. Oxido-reduction reactions. The repetition – enzymes and biological oxidations.(3h)

7th week

Seminar 3 - review -subjects 1-6 (3h) and semi- semester partial test.

8th week

L - 3. Carbohydrates (2h)

Functions of monosaccharide derivatives, oligo- and polysaccharides, glycoproteins and proteoglycans in human body. Digestion and absorption of carbohydrates. Glycolysis in anaerobic and aerobic conditions, gluconeogenesis, the pentose phosphate pathway.

Lc - 7. Determination of amylase activity. Identification of different sugars using redox reactions. (4h)

9th week

Lc – 8 Identification of different sugars using colour reactions. Identification of unknown sugar. (4h)

10th week

Lc – 9 Quantitative determination of a glucose concentration in the blood serum. (4h)

Seminar 4 - Glycogen metabolism- enzymes and regulation. Hormonal regulation of glucose levels in the blood (insulin, glucagon, epinephrine, glucocorticoids) Tissue specificity of carbohydrate metabolism (liver, brain, RBC, adipocytes, muscles) Disorders in carbohydrate metabolism. The repetition – properties, functions and metabolism of carbohydrates.(3h)

11th week

L - 4. Lipids (2h)

Classification, structures and properties of lipids. Digestion and absorption of lipids. Tissue specificity of lipid metabolism. Disorders in lipid metabolism Functions of phospholipids and glycosphingolipids.

Lc - 10 . Characteristics of lipolytic enzymes. Demonstration of bile effects on pancreatic lipase activity. Detection of bile acids and pigments.(4h)

12th week

Lc – 11 Extraction of lecithin from the yolk. Detection of lecithin components and unsaturated fatty acids. (4h)

13th week

Lc – 12 Determination of total serum cholesterol concentration, determination of serum TGs, HDL,LDL. (4h)

Seminar 5 - Metabolism of fatty acid- synthesis and β -oxidation, metabolism of triacylglycerols and ketone bodies. Metabolism of cholesterol, regulation of its synthesis. Functions and metabolism of bile salts. Structures, functions and metabolism of plasma lipoproteins . Eicosanoids. The repetition – properties, functions, metabolism of lipids.(3h)

14th week

Seminar 6 – review - subjects 7-12 (3h) and end semester partial test.

15th week- Retakes

II semester

1st week

L 5 - Metabolism of amino acids and catabolism of proteins. (3h)

Classification of proteolytic enzymes. Protein digestion. Mechanisms of amino acids absorption from the gastrointestinal tract. Protein turnover and regulation. Protein degradation in lysosomes and proteasomes. Ammonia metabolism.

Lc - 13. Determination of trypsin proteolytic activity. Quantitative determination of total acidity and a deficiency of hydrochloric acid in gastric juice. (4h)

2nd week

Lc – 14 Preparation and quantitative determination of liver alanine aminotransferase activity. (4h)

3rd week

Lc -15 Quantitative determination of urea in the blood serum (4h)

Seminar 7 - Amino acid decarboxylation. Metabolic blocks in the transformation of amino acids on the example of aromatic, branched chain amino acids and sulfur containing amino acids. The major reactions of amino acid degradation and fates of final products. Pathways of amino acid conversion to specialized products and their roles in the human body The repetition – protein catabolism and amino acid metabolism.(3h)

4th week

L - 6. Metabolism of nucleotides.(2h)

De novo synthesis of purine and pyrimidine nucleotides. Catabolism of nucleotides - final products of their degradation. Diseases associated with purine metabolism. Synthetic analogs of purines, pyrimidines, nucleosides, and nucleotides and their applications in clinical medicine.

Lc -16 Isolation of DNA, detection of its components. Quantitative determination of uric acid in the blood serum.(4h)

5th week

Lc – 17 Isolation of RNA,detection of its components. (4h)

6th week

Lc – 18 Electrophoresis of nucleic acids-comparison of different DNA samples. Technics in molecular biology (4h)

Seminar 8 – Comparison of DNA and RNA . Process of replication, transcription and translation- steps, enzymes, regulation. Posttranscriptional modifications of rRNA, mRNA and tRNA Ribosomes. Ribozymes. Genetic code. The repetition – nucleic acids metabolism (3h)

7th week

Seminar 9 - review -subjects 13-18 (3h) and semi- semester partial test.

8th week

L - 7. Vitamins and minerals: Vitamins: classification (water- and lipid-soluble), structure, nutritional requirements, sources, function and symptoms of their deficiency. The vitamins of the B complex. Vitamin C. Vitamin A. Vitamin D. Vitamin E. Vitamins K. Essential minerals (macrominerals) - nutritional requirements, metabolic role and deficiencies of calcium, chloride, magnesium, phosphorus, potassium, sodium. Trace minerals (microminerals) - nutritional requirements, metabolic role and deficiencies of iron, copper, iodine, cobalt, manganese, molybdenum, selenium, zinc **(2h)**

Lc - 19 . Detection of water-soluble and fat- soluble vitamins. Quantitative determination of vitamins in biological materials. (4h)

9th week

Lc – 20 Detection of 17-ketosteroids. Quantitative determination of testosterone. Quantitative determination of alkaline phosphatase activity in the blood serum (4h)

10th week

Lc – 21 Quantitative determination of a calcium concentration in the blood serum. (4h)

Seminar 10 - Hormones, integration of metabolism, and metabolic profiles of tissues: Hormones definition, classification according to site of synthesis, chemical structure, water solubility (solubility properties), location of receptor. Thyroid .Hormones of the anterior and posterior pituitary gland. Catecholamines. Steroid hormones. Hormonal regulation of water and electrolytes .Endocrine pancreas. Hormonal regulation of calcium and phosphate metabolism. Integration of metabolism. Metabolism after: postabsorptive state (after a meal), early fasting state (between meals, during sleep), and during starvation (prolonged periods of low food intake). Metabolic profiles of tissues: red blood cells (RBCs), brain, muscles, adipose tissue, and liver. (3h)

11th week

L - 8. Biochemistry of selected tissues. (2h)

Metabolism of erythrocytes. Functions of hemoglobin. Synthesis and catabolism of heme. Plasma proteins and their role in transport and storage for human body. Liver and its role for metabolism in humans.

Lc - 22 Identification of inorganic and organic components of the blood. Demonstration of peroxidative properties of the blood. Quantitative determination of a total bilirubin. (4h)

12th week

Lc 23 Salting out and quantitative determination of selected plasma proteins. (4h)

13th week

Lc 24 Detection of organic and inorganic constituents in the physiological urine. Detection of pathological constituents in urine. Titratable acidity.(4h)

Seminar 11 – Pathology of heme metabolism (porphyria, icterus). An acid-base balance – organs involved in the maintaining proper pH. An acid-base balance disorders. The repetition – biochemistry of the blood, the kidneys and liver.(3h)

14th week

Seminar 12 – review - subjects 19-24 (3h) and end semester partial test.

15th week- Retakes

Obligatory literature:

1. "LIPPINCOTT'S ILLUSTRATED REVIEWS: BIOCHEMISTRY" Denise R. Ferrier. Seventh edition. 2017 Wolters Kluwer

2. "HARPER'S ILLUSTRATED BIOCHEMISTRY" Robert K. Murray, David A. Bender, Kathleen Victor W. Rodwell. M. Botham, Peter J. Kennelly, P. Anthony Weil 31st edition. Mc Graw Hill ; LANGE

Complementary literature for lectures and laboratory classes:

1. "TEXT BOOK OF BIOCHEMISTRY WITH CLINICAL CORRELATIONS" Editor: Thomas M. Devlin

2. Lehninger,, PRINCIPLES OF BIOCHEMISTRY” International Edition; David L. Nelson, Michael M. Cox Seventh Edition 2017; Macmillan Learning, New York

3. Lab manuals from teachers

Requirements for didactic aids (e.g. laboratory, multimedia projector, others...)

1. Lecture halls, multimedia projectors, laptops, whiteboards, laboratory rooms, fume hoods, safety gloves and glasses, refrigerators, freezers, an equipment for electrophoresis and immunoblotting. shakers, spectrophotometers, centrifuges, magnetic stirrers, thermostats, dry and wet baths, electric ovens, dryers for glass equipment, automatic pipettes, pH meters, burettes and other laboratory glassware such as test tubes, beakers, Erlenmeyer flasks, graduated cylinders and etc.

Conditions for obtaining a credit for the subject:**RULES AND REGULATIONS**

The student is obligated to be familiar with all points of the “Rules and Regulations” of the Medical University of Lublin and “Rules and Regulations” and “Rules of safety and hygiene during practical classes” in the Department of Biochemistry and Molecular Biology

1. The student is obligated to participate in seminars, lab classes and lectures according to the list established and schedule in the timetable assigned by the Department of Education and Dean's Office.
2. Presence is obligatory at all lab classes, seminars and lectures. All seminars and lectures are conducted in remote mode. Students cannot leave practical lab classes without the permission of the teacher. Students should be on time for labs, seminars and lectures. Students may enter the lab class up to 15 min after the planned beginning of the class. Student coming later than within 15 min from the beginning of lab/seminar/lecture cannot participate in it and is considered as absent. Students should attend lab classes wearing white, clean lab coats and lab shoes.
3. The student must not have more than one unexcused absence in one semester. Absences must be excused by a doctor, the Dean or the Vice-Rector for Academic Affairs. Each kind of excuse has to be immediately submitted to the course coordinator. No longer than 3 working days from the date of its issue. The student does not get a credit for a semester due to more than one unexcused absence. In case of sickness the student is permitted to have maximum 2 excused absences at practical classes in each semester. The student may have problems with getting a credit for a semester due to a greater number of those absences. The student is obligated to make up practical classes abandoned due to excused absences on the principles established by the course coordinator. The student is obligated to be prepared for announced and unannounced quizzes from knowledge acquired during classes connected with the syllabus of the subject.
4. The student is obligated to get a credit at the end of each semester. He/she has to collect: lab reports/ protocols from all lab classes, minimum 24 points from seminars (what means 60% - 3.0) and he/she has to pass two partial exams with minimum 24 points from each (what means 60% - 3.0). The grade from the semester is the average of seminar grade in % and two partials' grades, each in % in every semester and it is established according to scale:

(less than 60%):	2.0 (fail)	2020-2021
(60-67,9%):	3.0 (pass)	
(68-75,9%):	3.5 (good enough)	
(76-83,9%):	4.0 (good)	
(84-90,9 %):	4.5 (better than good)	
(91-100%):	5.0 (very good)	
5. On each practical classes the student has to write results from the lab on the protocol paper. The student's lab work, skills and competences are graded by teacher (0-2 points). The student has to collect points from lab classes during each semester. In the case of excused or unexcused absence the student has to write an essay from the subject given by teacher to collect points from missing lab - maximum 2 points.
6. The student has to collect points from seminars during each part within semester, maximum 40 points in each, in the whole course of biochemistry he/she can collect maximum 80 points. At the end of each seminary in the particular subject the student has short test with 10 multiple-choice questions and he/she can obtain maximum 10 points from each test. During each semester the student is obligated to collect minimum 24 points from 40 points to grade seminars, what means 60% from the total amount of points. Unless the student collects the minimum number of points, he/she is allowed to make two another attempts to reach the minimum to grade. In the case of excused or unexcused absence during seminary the student is allowed to take two another attempts to reach the minimum to grade. All end-seminary tests are conducted in remote mode, according to recommendations, with using educational platforms of Medical University of Lublin.
7. Seminars before each partial exam are treated as a review seminary without MCQ test at the end.
8. The partial exams, the final exam (verifying learning outcomes) are conducted in form of the MCQ test on-site or in remote mode, according to recommendations, with using educational platforms of Medical University of Lublin. Preferable form of the final exam and all retakes of the final exam is MCQ-test. In the

case of extraordinary circumstances The Head of the Department with Coordinator have the right to change the form of the final exam and retakes of it from written exam to oral exam with 3 open questions..

9. The student is obligated to pass two semi –semester partials exams (every two subjects in one semester).If the student does not pass the partial exam can improve it in maximum two additional dates at the end of each semester. Each partial exam and each retake consists of 40 multiple-choice questions and true/false test and the student needs 60 % and more to pass. All dates for partial exams and their retakes are given in the timetable of the course by coordinator.

Partial tests' and seminars' grading scale:

0-23 points (less than 60%):	2.0 (fail)	2020-2021
24-27 points (60-67,9%):	3.0 (pass)	
28-30 points (68-75,9%):	3.5 (good enough)	
31-33 points (76-83,9%):	4.0 (good)	
34-36 points (84-90,9%):	4.5 (better than good)	
37-40 points (91-100%):	5.0 (very good)	

10. Only students who pass all partial exams may take part in the final exam in biochemistry and molecular biology at the end of the course.
11. The UMLUB final exam, the first and the second retake of the UMLUB final exam is in the form of a multiple-choice test where only one answer is good. The final exam and each of the retake of the final consists of 80 multiple-choice questions and the student needs 60 % and more to pass. In the case of excused absence (confirmed by doctor's note) the student takes partial and final exams in the form of a test intended for the retake time. In the case of unexcused absences on partials and the final exam the student takes unsatisfactory grade. The questions of the final exam are based on knowledge from required and recommended textbooks, lectures, seminars and practical classes according to the syllabus of the subject. The student is obligated to have the student's ID (with photo) issued by the Medical University of Lublin on all partial exams and final exams.
12. Conditions for obtaining a credit for the subject: Final grade from the subject will be the net value based on the grades obtained during (1) Final exam performed by the UMLUB Department (70% - 0.7) (vide above) and (2) NBME subject shelf-exam (30% - 0.3). For example, if student gained 65% of correct answers during UMLUB exam and 55% during NBME exam – the final score will be: $65\% \times 0.7 + 55\% \times 0.3 = 62\%$ (grade 3.0). 1st and 2nd retake will be performed only by the UMLUB Department. The final performed by the UMLUB Department – 80 MCQ test and NBME subject shelf-exam 24 Questions. Total 104 questions

UMLUB Final exam's grading scale:

0-47 points (less than 60%):	2.0 (fail)	2020-2021
48-54 points (60-67,9%):	3.0 (pass)	
55-60 points (68-75,9%):	3.5 (good enough)	
61-67 points (76- 83,9%):	4.0 (good)	
68-72 points (84-90,9%):	4.5 (better than good)	
73-80 points (91-100%):	5.0 (very good)	

13. **Using of mobile phones or any other electronic devices during all lectures, seminars, lab classes, partials and exams is strictly forbidden.**
14. **Recording, copy and distribution of any kind of lectures, seminars, practical classes and tests from exams without the permission of a teacher is prohibited (copyright).**
15. "Any attempts of cheating during partials or exams will be punished through the annulment of the exams and could result in expulsion of the student from the University". Any form of cheating results in notification of the Dean's Office.

The name and address of the department/clinic where the course is taught (module/course); contact details (phone number/ email address):

CHAIR AND DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY
Medical University of Lublin; 1 Chodźki Street; 20-093 Lublin; Collegium Universum
Phone number: (+48) 81 4486350 ; (+48) 81 4486352

Names of the author/authors of this syllabus:

Agnieszka Stenzel-Bembenek MD, PhD agnieszkastenzelbembenek@umlub.pl

Andrzej Stepulak MD, PhD, Prof. andrzej.stepulak@umlub.pl

Names of the teacher/teachers conducting classes:

Marek Cybulski MD, PhD Associate Professor ,Magdalena Dmoszyńska-Graniczka MD PhD, Agnieszka Stenzel-Bembenek MD, PhD, Aneta Grabarska PhD, Małgorzata Guz PhD, Witold Jeleniewicz PhD, Agata Jarzab PhD, Ewelina Gumbarewicz PhD, Michał Kielbus PhD, Anna Jaruga MSc, Ewa Hordyjewska-Kowalczyk MSc

Signature of the head of the department/clinic

Dean's signature

.....

.....

Date of submission: