

**Course description (syllabus) form for higher education, doctoral,
postgraduate and skills development programmes**

A. General course description

[Filled out by teacher/course coordinator except for the following fields marked in blue:]

- 1) *course title,*
- 2) *unit organising the course,*
- 3) *unit for which the course is organised,*
- 4) *course ID,*
- 5) *ISCED code,*
- 6) *ECTS credit allocation,*
- 7) *form of course completion assessment,*
- 8) *language of instruction,*
- 9) *indication whether attempts at obtaining course credit can be repeated,*
- 10) *affiliation of the course to a course group].*

Field name	Comments
Course title	<i>Biochemia Biochemistry</i>
Unit organising the course	<i>Faculty of Medicine Department of Medical Biology and Biochemistry Ludwik Rydygier Collegium Medicum Nicolaus Copernicus University</i>
Unit for which the course is organised	<i>Faculty of Medicine Field of study: Medicine, full-time studies, long cycle</i>
Course ID	<i>1655-LekM12BIOBIO-J</i>
ISCED code	<i>0912</i>
ECTS credit allocation	<i>5.00</i>
Form of course completion assessment	<i>ungraded credit</i>
Language of instruction	<i>English</i>
Indication whether attempts at obtaining course credit can be repeated	<i>no</i>
Affiliation of the course to a course group	
Total student workload	<p><i>1. The workload associated with activities requiring direct participation of academic teachers is:</i></p> <ul style="list-style-type: none"> <i>- participation in lectures: 30 hours</i> <i>- participation in tutorials: 33 hours</i> <i>- participation in seminars: 12 hours</i> <i>- consultation: 7 hours</i> <i>- passing the tests: 4 hours</i> <i>- passing the exam: 2 hours</i> <p><i>The workload associated with classes requiring direct participation of academic teachers is 88 hours, which corresponds to 3.52 ECTS points</i></p> <p><i>2. Balance of student workload:</i></p> <ul style="list-style-type: none"> <i>- participation in lectures: 30 hours</i> <i>- participation in tutorials: 33 hours</i> <i>- participation in seminars: 12 hours</i> <i>- preparation for tutorials and seminars: 10 hours</i> <i>- writing tutorial reports: 3 hours</i>

	<p>- reading the indicated literature: 10 hours - consultation: 7 hours - preparation for the test and passing the test: 10 hours - preparation to the exam and the exam: 10 hours The total student workload is 125 hours, which corresponds to 5 ECTS points</p> <p>3. Workload related to scientific research: - reading of the indicated scientific literature: 10 hours - research and scientific consultations: 7 hours - participation in lectures (including methodology of scientific research, results of research, studies): 30 hours - participation in tutorials and seminars covered by scientific activity (including methodology of scientific research, research results, studies): 45 hours - preparation for tutorials and seminars covered by scientific activity: 10 hours - preparation to pass in the area of research and science aspects for a given subject: 10 hours - writing reports on tutorials covered by scientific activity: 3 hours The total amount of student work associated with the conducted research is 115 hours, which corresponds to 4.60 ECTS points</p> <p>4. Time required to prepare and participate in the assessment process: - preparation for passing + credit: 8 hours - reading the indicated literature: 10 hours - preparation for the exam and exam: 10 hours The total amount of student work involved in preparing for the participation in the assessment process is 28 hours, which corresponds to 1.12 ECTS points</p> <p>5. Balance of student workload of a practical nature: - participation in tutorials: 33 hours The total student workload of a practical nature is 33 hours, which corresponds to 1.32 ECTS points</p> <p>6. Time required for compulsory placement: not applicable</p>
<p>Learning outcomes – knowledge</p>	<p>W1: characterizes the structure and functions of organic compounds that are part of macromolecules, knows their role in the body - B K_W10 W2: describes the functions of lipids in the cellular and extracellular compartments - B K_W11 W3: describes the functions of polysaccharides in the cellular and extracellular compartments - B K_W11 W4: understands the importance of protein structure for its proper function and the influence of protein structure disturbances in pathological processes - B K_W12 W5: describes the structure as well as metabolic and regulatory functions of nucleotides - B K_W13 W6: knows the course of major catabolic and anabolic pathways - B K_W15 W7: knows the regulation of the main metabolic pathways, basic environmental and genetic disturbances of these pathways and diseases associated with these disorders - B K_W15 W8: describes the specificity of metabolic processes in the main organs and systems (liver, kidney, muscle, brain, fat tissue, intestine)- B K_W16 W9: characterizes the concept of oxidative potential of the body and oxidative stress, knows the physiological and pathological significance of free oxygen radicals, knows the antioxidant systems of the body - B K_W17</p>

	<p><i>W10: describes the role of kidney in maintaining the body's water-electrolyte balance – B K_W01</i></p> <p><i>W11: characterizes the participation of kidney in maintaining acid-base balance - B K_W02</i></p> <p><i>W12:describes the molecular mechanisms of receiving a light stimulus - B K_W07</i></p>
Learning outcomes – skills	<p><i>U1: calculates molar and percentage concentrations of compounds measured in biological samples - B K_U03</i></p> <p><i>U2: determines the pH of body fluids and the effect of pH changes on their properties - B K_U05</i></p> <p><i>U3: predicts the direction of major metabolic pathways in cells and tissues depending on the energy demand - B K_U06</i></p> <p><i>U4: uses qualitative and quantitative analysis, colorimetry, pH-parameters, protein electrophoresis, analyzes and interprets the results obtained - B K_U09</i></p> <p><i>U5: uses analytical balance, spectrophotometer, pH-meter and evaluates the accuracy of measurements – B K_U10</i></p>
Learning outcomes - social competence	<p><i>K1: is aware of the limitations of the scope of his knowledge and of the necessity of its permanent supplementing - K_K01</i></p> <p><i>K2: has the need and ability to constantly supplement his knowledge - K_K08</i></p>
Teaching methods	<p><i>Lecture:</i> <i>expository teaching methods - informative (traditional) lecture with multimedia presentation, problem-based teaching methods - discussion method</i></p> <p><i>seminar:</i> <i>expository teaching methods - a talk, problem-based teaching methods - classic problem method, discussion method, case method, discovery teaching methods - project method</i></p> <p><i>tutorial:</i> <i>expository teaching methods - explanation, problem-based teaching methods – classic problem method, didactic discussion, discovery teaching methods - laboratory practicals, practical exercises, demonstration</i></p>
Prerequisites	<p><i>Student beginning the course „Biochemistry” should have knowledge acquired during the course of study, especially in the field of the subject Molecular basis of metabolism and Molecular biology.</i></p>
Brief course description	<p><i>„Biochemistry” course is carried out in the second semester. It consists of 30 hours of lectures, 33 hours of tutorials, and 12 hours of seminars. The aim of the course is to prepare students for learning clinical subjects, as well as to work in a future profession. The topics provided allow to learn the course of major metabolic pathways, their regulation, the specificity of biochemical changes in the main tissues and systems of the human body, as well as understanding the role of disorders of these processes in the development of major metabolic diseases of environmental and genetic origin.</i></p>
Full course description	<p><i>Lectures:</i></p> <p><i>1. Glucose as a source of ATP - reactions of glycolysis, substrate phosphorylation, regulation of glycolysis. Glycolysis under anaerobic conditions, glycolysis in the red blood cell. Entering fructose and galactose in glycolysis. Disturbances of fructose and galactose metabolism. Oxidative decarboxylation of pyruvate and the regulation of this process.</i></p> <p><i>2. Pentose phosphate pathway, its special role in the body, disorders resulting from the lack of NADPH synthesis. The major metabolic pathways of the red blood cell. The course and regulation of gluconeogenesis.</i></p> <p><i>3. Synthesis and degradation of glycogen, diseases resulting from disorders of glycogen metabolism. Hormonal regulation of the glucose level in the blood - the role of insulin, glucagon, adrenaline.</i></p>

4. *The tricarboxylic acid cycle - the energy gain of the cycle. Mitochondrial transmembrane transport systems and NADH transport shuttles. The respiratory chain, inhibitors and compounds uncoupling oxidative phosphorylation. Cell bioenergetics, the final ATP yield of oxidation of the glucose molecule. Reactive oxygen species generation. Cell damage caused by reactive oxygen species. Antioxidant defense.*

5. *The role of carnitine in the transport of fatty acids. β -oxidation of saturated and unsaturated fatty acids. Energy balance of β -oxidation. β -oxidation of fatty acids with an odd number of carbon atoms in the chain. Metabolism of ketone bodies.*

6. *Synthesis and elongation of fatty acids, formation of unsaturated bonds. The role of arachidonic acid - the synthesis of eicosanoids (prostaglandins, prostacyclins, thromboxanes and leukotrienes) and their biochemical significance. Synthesis of glycerolphospholipids and sphingolipids.*

7. *Transport of cholesterol in blood by lipoproteins. Dyslipoproteinaemias. The synthesis of cholesterol and the regulation of this process in the human body. Biosynthesis of bile acids and regulation of this process.*

8. *Biosynthesis of nutritionally non-essential amino acids in the human body. The most important enzymes involved in the transformation of amino acids and the removal of amine nitrogen. The urea cycle.*

9. *Catabolism of amino acids. Glucogenic and ketogenic amino acids. Selected metabolic disorders in the catabolism of amino acids. Amino acid transformations into biologically important, specialized products. Metabolism of single-carbon residues. The role of one-carbon residues in the biosynthesis of biologically important compounds.*

10. *Nomenclature and structure of purine and pyrimidine bases, including atypical ones. Synthesis of purines and pyrimidines and regulation of these processes. Catabolism of purine and pyrimidine bases. Selected diseases associated with disorders of purine catabolism.*

11. *Synthesis and catabolism of heme, regulation of these processes. Bilirubin transport in plasma, the role of the liver in conjugation of bilirubin. Enterohepatic circulation of bile compounds. Hyperbilirubinemias. Diagnostic significance of total bilirubin, bilirubin differentiation between indirect (free) and direct (bound) bilirubin. The diagnostic role of indirect and direct bilirubin.*

12. *Liver as the metabolic center of the body. The role of the liver in detoxification processes. The role of the liver in maintaining the proper level of glucose in the blood.*

13. *Biochemical function of the kidney. Diagnostic significance of metabolites excreted in the urine.*

14. *Classification of hormones. The most important hormones affecting the metabolism of carbohydrates, lipids and proteins in muscle, liver and adipose tissue. Synthesis of thyroid hormones.*

15. *Metabolic profile of major organs and tissues. Summary of metabolic pathways of carbohydrates, lipids and amino acids in liver, brain, skeletal muscle, myocardium and kidney cells. Links between the metabolism of carbohydrates, lipids and amino acids. Compounds and processes that are a source of ATP for skeletal muscle cells at rest and during work - sprint and marathon. Metabolic changes occurring during fasting and after a meal. Metabolic changes accompanying type 1 and type 2 diabetes.*

Seminars:

- 1. Disorders of carbohydrate metabolism - selected diseases.*
- 2. Lipid metabolism disorders - selected diseases.*
- 3. Amino acid metabolism disorders - selected diseases.*
- 4. Medical aspects of major metabolic disorders in selected organs.*

Tutorials:

	<ol style="list-style-type: none"> 1. Some properties of disaccharides and polysaccharides. 2. Glucose tolerance test. 3. Physico-chemical properties of lipids. 4. Lipidogram. 5. Biological oxidation. 6. Qualitative and quantitative analysis of the urine of a healthy person. 7. Qualitative and quantitative analysis of urine in selected diseases. 8. Diagnosis of jaundice. 9. Diagnostic parameters of blood in kidney diseases. 10. Diagnostic enzymes of blood in liver diseases. 11. Revision. 														
Literature	<p>1) <i>Leading textbook:</i> Rodwell VW, Bender D, Botham KM, Kennelly PJ, Weil PA. <i>Harpers Illustrated Biochemistry, 30th Edition, McGraw-Hell Mecical 2015 (or 31th Edition, 2018)</i></p> <p>2) <i>Supplementary handbooks:</i> Lieberman M, Peet A. <i>Marks' Basic Medical Biochemistry. A Clinical Approach, 5th Edition, Wolters Kluwer 2018</i> Ferrier DR. <i>Lippincott Illustrated Reviews: Biochemistry, 7th Edition, Wolters Kluwer 2017</i> Ronner P. <i>Netter's Essential Biochemistry, Elsevier 2018</i></p>														
Assessment methods and criteria	<p>1. <i>Intrasestral test (MCQ): W1-W12, U1-U3, K1, K2.</i> <i>In the case of the intrasestral test, the points obtained are converted into grades according to the following scale:</i></p> <table border="1" data-bbox="598 1019 1021 1265"> <thead> <tr> <th>% points</th> <th>Grade</th> </tr> </thead> <tbody> <tr> <td>92-100</td> <td>Very good</td> </tr> <tr> <td>84-91</td> <td>Good plus</td> </tr> <tr> <td>76-83</td> <td>Good</td> </tr> <tr> <td>68-75</td> <td>Satisfactory plus</td> </tr> <tr> <td>56-67</td> <td>Satisfactory</td> </tr> <tr> <td>0-55</td> <td>Fail</td> </tr> </tbody> </table> <p>2. <i>Oral or written answer (evaluation of active participation and preparation for the classes): W1-W12, U1-U5, K1, K2.</i> <i>In order to pass the student must get a minimum of 60% of the points from the answer.</i></p> <p><i>In the case of an oral or written answer to the assessment of the learning outcomes achieved by the student, the following criteria are applied:</i></p> <ul style="list-style-type: none"> - credit in the case when: the student knows the basic issues and has mastered the program minimum, understands the questions asked, presents his knowledge in a logical and systematic way, can practically apply the acquired knowledge; - failure to pass if: the student has not mastered the program minimum, does not understand the questions, provides answers not on the subject, does not properly use the basic vocabulary, can not practically apply the acquired knowledge. <p>3. <i>Focused observation of the student's activity while performing practical tasks: U1, U2, U4, U5.</i> <i>In order to pass the student must get a minimum of 60% of points for a properly completed activity.</i></p> <p>4. <i>Report: W1-W12, U1, U2, U4, U5, K1, K2.</i> <i>In order to pass the student must get a minimum of 60% of points for the presented report on the tutorials.</i></p>	% points	Grade	92-100	Very good	84-91	Good plus	76-83	Good	68-75	Satisfactory plus	56-67	Satisfactory	0-55	Fail
% points	Grade														
92-100	Very good														
84-91	Good plus														
76-83	Good														
68-75	Satisfactory plus														
56-67	Satisfactory														
0-55	Fail														

	<p>5. Oral presentation: W1-W12, U3, K1, K2. In order to pass the student must get a minimum of 60% of points for the presentation.</p> <p>6. Activity – extended observation: K1, K2. In order to pass the student must get a minimum of 50%.</p>
Work placement	not applicable

B. Description of the course within the period of instruction

[Filled out by teacher/course coordinator except for the following fields marked in blue:

- 1) period of instruction,
- 2) form of assessment of course completion in the period of instruction,
- 3) form(s) of classes, number of hours and completion assessment methods,
- 4) name of course coordinator in the period of instruction,
- 5) names of persons managing student groups for the course,
- 6) course attributes,
- 7) course groups including description and limit to the number of students within the groups,

Field name	Komentarz
Period of instruction	Year I, semester II - summer semester
Form of assessment of course completion in the period of instruction	ungraded credit
Form(s) of classes, number of hours and completion assessment methods	Lectures: 30 hours, ungraded credit Seminars: 12 hours, ungraded credit Tutorials: 33 hours, ungraded credit
Name of course coordinator in the period of instruction	Karolina Szewczyk-Golec, PhD, Associate Professor
Names of persons managing student groups for the course	Karolina Szewczyk-Golec, PhD, Daria Kupczyk, PhD, Rafał Bilski, MSc
Course attributes	Obligatory subject
Course groups including description and limit to the number of students within the groups	Lectures for the whole year Seminar groups up to a maximum of 24 students Tutorial groups up to a maximum of 12 students
Time and place of classes	dates and places of classes are specified by the Department of Didactics of Collegium Medicum tutorials and seminars: lab classes at the Department of Biology and Medical Biochemistry of CM UMK
Learning outcomes defined for a given form of classes within the course	Lecture: W1: characterizes the structure and functions of organic compounds that are part of macromolecules, knows their role in the body - B_K_W10 W2: describes the functions of lipids in the cellular and extracellular compartments - B_K_W11 W3: describes the functions of polysaccharides in the cellular and extracellular compartments - B_K_W11

W4: understands the importance of protein structure for its proper function and the influence of protein structure disturbances in pathological processes - B K_W12

W5: describes the structure as well as metabolic and regulatory functions of nucleotides - B K_W13

W6: knows the course of major catabolic and anabolic pathways - B K_W15

W7: knows the regulation of the main metabolic pathways, basic environmental and genetic disturbances of these pathways and diseases associated with these disorders - B K_W15

W8: describes the specificity of metabolic processes in the main organs and systems (liver, kidney, muscle, brain, fat tissue, intestine)- B K_W16

W9: characterizes the concept of oxidative potential of the body and oxidative stress, knows the physiological and pathological significance of free oxygen radicals, knows the antioxidant systems of the body - B K_W17

W10: describes the role of kidney in maintaining the body's water-electrolyte balance – B K_W01

W11: characterizes the participation of kidney in maintaining acid-base balance - B K_W02

W12:describes the molecular mechanisms of receiving a light stimulus - B K_W07

U1: calculates molar and percentage concentrations of compounds measured in biological samples - B K_U03

U2: determines the pH of body fluids and the effect of pH changes on their properties - B K_U05

U3: predicts the direction of major metabolic pathways in cells and tissues depending on the energy demand - B K_U06

K1: is aware of the limitations of the scope of his knowledge and of the necessity of its permanent supplementing - K_K01

K2: has the need and ability to constantly supplement his knowledge - K_K08

Seminar:

W1: characterizes the structure and functions of organic compounds that are part of macromolecules, knows their role in the body - B K_W10

W2: describes the functions of lipids in the cellular and extracellular compartments - B K_W11

W3: describes the functions of polysaccharides in the cellular and extracellular compartments - B K_W11

W4: understands the importance of protein structure for its proper function and the influence of protein structure disturbances in pathological processes - B K_W12

W5: describes the structure as well as metabolic and regulatory functions of nucleotides - B K_W13

W6: knows the course of major catabolic and anabolic pathways - B K_W15

W7: knows the regulation of the main metabolic pathways, basic environmental and genetic disturbances of these pathways and diseases associated with these disorders - B K_W15

W8: describes the specificity of metabolic processes in the main organs and systems (liver, kidney, muscle, brain, fat tissue, intestine)- B K_W16

W9: characterizes the concept of oxidative potential of the body and oxidative stress, knows the physiological and pathological significance of free oxygen radicals, knows the antioxidant systems of the body - B K_W17

W10: describes the role of kidney in maintaining the body's water-electrolyte balance – B K_W01

	<p>W11: characterizes the participation of kidney in maintaining acid-base balance - B K_W02</p> <p>W12:describes the molecular mechanisms of receiving a light stimulus - B K_W07</p> <p>U3: predicts the direction of major metabolic pathways in cells and tissues depending on the energy demand - B K_U06</p> <p>K1: is aware of the limitations of the scope of his knowledge and of the necessity of its permanent supplementing - K_K01</p> <p>K2: has the need and ability to constantly supplement his knowledge - K_K08</p> <p>Tutorial:</p> <p>W1: characterizes the structure and functions of organic compounds that are part of macromolecules, knows their role in the body - B K_W10</p> <p>W2: describes the functions of lipids in the cellular and extracellular compartments - B K_W11</p> <p>W3: describes the functions of polysaccharides in the cellular and extracellular compartments - B K_W11</p> <p>W4: understands the importance of protein structure for its proper function and the influence of protein structure disturbances in pathological processes - B K_W12</p> <p>W5: describes the structure as well as metabolic and regulatory functions of nucleotides - B K_W13</p> <p>W6: knows the course of major catabolic and anabolic pathways - B K_W15</p> <p>W7: knows the regulation of the main metabolic pathways, basic environmental and genetic disturbances of these pathways and diseases associated with these disorders - B K_W15</p> <p>W8: describes the specificity of metabolic processes in the main organs and systems (liver, kidney, muscle, brain, fat tissue, intestine)- B K_W16</p> <p>W9: characterizes the concept of oxidative potential of the body and oxidative stress, knows the physiological and pathological significance of free oxygen radicals, knows the antioxidant systems of the body - B K_W17</p> <p>W10: describes the role of kidney in maintaining the body's water-electrolyte balance – B K_W01</p> <p>W11: characterizes the participation of kidney in maintaining acid-base balance - B K_W02</p> <p>W12:describes the molecular mechanisms of receiving a light stimulus - B K_W07</p> <p>U1: calculates molar and percentage concentrations of compounds measured in biological samples - B K_U03</p> <p>U2: determines the pH of body fluids and the effect of pH changes on their properties - B K_U05</p> <p>U3: predicts the direction of major metabolic pathways in cells and tissues depending on the energy demand - B K_U06</p> <p>U4: uses qualitative and quantitative analysis, colorimetry, pH-parameters, protein electrophoresis, analyzes and interprets the results obtained - B K_U09</p> <p>U5: uses analytical balance, spectrophotometer, pH-meter and evaluates the accuracy of measurements – B K_U10</p> <p>K1: is aware of the limitations of the scope of his knowledge and of the necessity of its permanent supplementing - K_K01</p> <p>K2: has the need and ability to constantly supplement his knowledge - K_K08</p>
<p>Assessment methods and criteria for a given form of classes within the course</p>	<p>Lecture:</p> <ol style="list-style-type: none"> Intrasestral test (MCQ) (>60%): W1-W12, U1-U3, K1, K2. Extended observation (>50%): K1, K2.

Seminar:

- 1. Oral or written answer (>60%): W1-W12, U3, K1, K2.*
- 2. Oral presentation (>60%): W1-W12, U3, K1, K2.*
- 3. Extended observation (>50%): K1, K2.*

Tutorial:

- 1. Intrasemestral test (MCQ) (>60%): W1-W12, U1-U3, K1, K2.*
- 2. Oral or written answer (>60%): W1-W12, U1-U5, K1.*
- 3. Focused observation of the student's activity while performing practical tasks (>60%): U1, U2, U4, U5.*
- 4. Report (>60%): W1-W12, U1, U2, U4, U5, K1, K2.*
- 5. Extended observation (>50%): K1, K2.*

In the case of the intrasemestral test, the points obtained are converted into grades according to the following scale:

<i>% points</i>	<i>Grade</i>
<i>92-100</i>	<i>Very good</i>
<i>84-91</i>	<i>Good plus</i>
<i>76-83</i>	<i>Good</i>
<i>68-75</i>	<i>Satisfactory plus</i>
<i>56-67</i>	<i>Satisfactory</i>
<i>0-55</i>	<i>Fail</i>

In the case of an oral or written answer to the assessment of the learning outcomes achieved by the student, the following criteria are applied:

- credit in the case when: the student knows the basic issues and has mastered the program minimum, understands the questions asked, presents his knowledge in a logical and systematic way, can practically apply the acquired knowledge;*
- failure to pass if: the student has not mastered the program minimum, does not understand the questions, provides answers not on the subject, does not properly use the basic vocabulary, can not practically apply the acquired knowledge.*

In order to receive the credit for the course the student must obtain positive results from two intrasemestral tests and a positive assessment in the field of social competences (the appropriate number of points from all assessed criteria).

Course content

Lectures:

- 1. Glycolysis. The fate of pyruvate.*
- 2. The pentose pathway. Gluconeogenesis.*
- 3. Glycogen metabolism.*
- 4. Krebs cycle. Respiratory chain. Oxidative stress.*
- 5. β -oxidation of fatty acids. Metabolism of ketone bodies.*
- 6. Lipid synthesis.*
- 7. Lipoproteins. Synthesis of cholesterol and bile acids.*
- 8. Biosynthesis of nutritionally non-essential amino acids. The urea cycle.*
- 9. Catabolism of amino acids.*
- 10. Purines and pyrimidines.*
- 11. Synthesis and catabolism of heme. Hyperbilirubinemias.*
- 12. Liver as the metabolic center of the body.*
- 13. Biochemical function of the kidney.*
- 14. Classification of hormones.*
- 15. Metabolic profile of major organs and tissues.*

Seminars:

- 1. Disturbances in carbohydrate metabolism.*
- 2. Lipid metabolism disorders.*

	<p>3. Disorders of amino acid metabolism. 4. Medical aspects of metabolic disorders in selected organs. Tutorials: 1. Selected properties of disaccharides and polysaccharides. 2. Glucose tolerance test. 3. Physico-chemical properties of lipids. 4. Lipidogram. 5. Biological oxidation. 6. Qualitative and quantitative analysis of the urine of a healthy person. 7. Qualitative and quantitative analysis of urine in selected diseases. 8. Diagnosis of jaundice. 9. Diagnostic parameters of blood in kidney diseases. 10. Diagnostic enzymes of blood in liver diseases. 11. Repetitorium.</p>
Teaching methods	<p>Lecture: expository teaching methods - informative (traditional) lecture with multimedia presentation, problem-based teaching methods - discussion method seminar: expository teaching methods - a talk, problem-based teaching methods - classic problem method, discussion method, case method, discovery teaching methods - project method tutorial: expository teaching methods - explanation, problem-based teaching methods – classic problem method, didactic discussion, discovery teaching methods - laboratory practicals, practical exercises, demonstration</p>
Literature	The same as in part A