


University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Medical biochemistry 1			
Teachers: Spasojević-Kalimanovska V Vesna, Bogavac-Stanojević B Nataša, Kotur-Stevuljević M Jelena			
Course status: Mandatory			
Semester: I		Year of studies: I	
ECTS points: 15		Course code: 6BHD01MB1	
Requirements: None			
Course aims: The main objective is the investigation and assessment of biochemical changes during human diseases and understanding of clinical, scientific and technological principles of medical biochemistry. Understanding the significance of preanalytical variations, analytical methods in laboratory work and interpretation of laboratory results.			
Course outcomes: Understanding the role of biochemical laboratory in diagnostics, monitoring and therapy of human diseases; comprehension of the principles of analytical methods that are performed in clinical-biochemistry laboratories and capacity to evaluate and interpret laboratory results; knowledge of the principles of analytical tests to be carried out in clinical biochemical laboratories; knowledge of the proper collection and treatment of the biological material; ability to assess and interpret laboratory results.			
Course contents: <i>Lectures</i> Disturbances in the metabolism of carbohydrates. Laboratory diagnosis and monitoring of diabetes. Hypoglycaemia. Plasma proteins: functions of plasma proteins, albumin, fibrinogen and immunoglobulins. Acute phase proteins. Dysproteinemia. The complement system. Iron homeostasis. Hemoglobinopathies. Porfirinopatije. Structure and function of enzymes. The kinetics of enzymatic reactions. Isoenzymes. Clinical enzymology. Lipoprotein metabolism and dyslipidemia. Biochemical markers and risk factors for atherosclerosis. Biochemical markers of oxidative stress and antioxidant protection. Cardiometabolic risk. Examination of functions of the cardiovascular system. Cardiac biomarkers in acute coronary sindromu. Inborn errors in the metabolism of amino acids, carbohydrates and lipids. <i>Practical classes</i> Types of biological specimens. Preanalytical variations in determining the biochemical parameters. Analytical methods in medical biochemistry. Principles of immunochemical and enzymatic methods in medical biochemistry. Techniques separation of biomolecules. Electrophoretic separation of proteins and lipoproteins.			
Recommended literature: 1. Burtis CA, Ashwood ER, Bruns DE (editors). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 7th Edition. St. Louis, MO: Elsevier, 2015. 2. Spasić S, Jelić-Ivanović Z, Spasojević-Kalimanovska V. Medicinska biohemija, Beograd, 2004. 3. Majkić-Singh N. Medicinska biohemija, DMBSG, Beograd, 2006. 4. McPherson RA, Pincus MR. Henry's Clinical diagnosis and management by Laboratory methods. 22nd edition, Elsevier, 2016. 5. Marshall WJ, Banget SK. Clinical Biochemistry, Second Edition, Elsevier, London 2008. 6. Kaplan LA, Pesce AJ, Kazmierczak S. Clinical Chemistry, 5th Edition - Theory, Analysis, Correlation. W.B. Saunders Company, 2010			
The total of active learning classes			
Lectures:		Practical classes:	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Oral lectures and practical classes - interactive classes: workshops, discussions, tests, home works, seminars and e-learning.			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	


Practical classes		Written	60
Workshops		Oral	
Colloquia	15		
Seminars	10		
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Laboratory hematology			
Teachers: Violeta B. Dopsaj			
Course status: Mandatory			
Semester: I		Year of studies: I	
ECTS points: 10		Course code: 6БХДО1ЛБХ	
Requirements:			
Course aims: Introduction to laboratory methods in hematology used in the diagnosis of hematologic disorders, their principles and method of performance, interpretation of results and application in clinical practice. Acquiring wider knowledge in the field of laboratory diagnostics in haemostasis and thrombosis in order to set diagnosis, application of therapy and monitoring of the effects of therapy, application of laboratory guides and diagnostic protocols.			
Course outcomes: Acquiring knowledge and skills necessary for knowledge of pre-analytical procedures in hematology and haemostasis, for performing laboratory methods in hematology and haemostasis, for automated determination of hematological parameters, for quality control and for interpretation of results in relation to the applied laboratory protocol.			
Course contents: <i>Lectures</i> General morphology of blood cells in peripheral blood, counting blood cells. Preanalytic procedures. Automation in hematology. Analysis of peripheral blood smear. Specialized laboratory tests in hematology with the basics of immunohematology. Disorders of leukocytes, erythrocytes, and platelets. General haemostasis. Specialized laboratory tests in hemostasis. Laboratory guides. Fundamentals of transfusiology. <i>Practical classes</i> Blood sampling in hematology and haemostasis, microscopic determination of leukocytes and platelets, determination of hemoglobin, principles of hematology analysers, interpretation of results, analysis of blood smear, quality control on hematology analysers. Test in hemostasis, principles of coagulometer performance, interpretation of results, quality control in hemostasis. Collection and storage of blood samples for serological tests, general principles of serological techniques.			
Recommended literature: 1. McKenzie, Chirlyn B. Clinical Laboratory haematology. Pearson education, 2 nd ed, 2010. 2. Kandice Kottke-Marchant, Bruce H. Davis. Laboratory hematology practice. Blackwell Publishing Ltd. 2012. 3. Bernadette F. Rodak, George A. Fritsma, Elaine M. Keohane. Hematology: Clinical principles and applications. Elsevier Saunders, 4 th ed 2012. 4. Dacie and Lewis. Practical Haematology. Elsevier Churchill Livingstone, 11 th ed, 2012.			
<p style="text-align: center;">The total of active learning classes</p>			
Lectures:		Practical classes: 15	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Interactive theoretical and practical lessons: workshops, panel discussions, tests, homework, seminars, e-learning			
<p style="text-align: center;">Grading system</p>			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia	20		

Seminars		
Other activities		

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS	
Study programme: Biochemical diagnostics		
Course title: Microbiology		
Teachers: Marina Milenković		
Course status: Изборни		
Semester: 1	Year of studies: 1	
ECTS points: 5	Course code: 6BHDIZMIK	
Requirements: none		
Course aims: To provide knowledge regarding : classification, structure and virulence factors of pathogenic and opportunistic microorganisms (bacteria, viruses, protozoa, helminthes, fungi) , principles of laboratory diagnosis of human infectious diseases, epidemiology, prevention and control of human infections (active and passive immunization). Acquiring basic knowledge about mechanisms of action and mechanisms of resistance to antimicrobial agents.		
Course outcomes: Knowing the general principles and skills of aseptic work in microbiological laboratory. Student is expected to obtain knowledge about classification, morphology and virulence factors of pathogenic microorganisms (bacteria, viruses, protozoa, helminthes, fungi). Knowing epidemiology of infectious diseases and laboratory methods for identification of pathogenic microorganisms (microscopy and staining of microorganisms, bacteriological media: preparation of different media and cultivation of bacteria, nonculture methods for the identification). Knowing measures of prevention of human infectious diseases. After completing the course the students are expected to know molecular mechanisms of action of antimicrobial agents (antibiotics, antiviral drugs, antifungal and antiparasitic drugs) and methods for determination of antimicrobial activity.		
Course contents: <i>Lectures</i> General principles of laboratory diagnosis of bacterial infections .Bacterial virulence factors and pathogenesis of bacterial infection. The diagnosis of bacterial infections at different body sites (collection, transport, processing, and examination of clinical specimens, cultivation of bacteria and nonculture methods for identification). General properties of viruses, classification of viruses. Characteristics of human DNA and RNA viruses. Laboratory diagnosis of viral infections (cultivation and detection of viruses, serological testing for antibodies, genetic analysis - detection of viral nucleic acid using specific probes). Interferons, vaccines and antiviral drugs. Medical parasitology: biological and morphological classification of protozoa. Protozoa of intestinal and urogenital tract, blood and tissue protozoa. Medical helminthology: classification of helminthes, life cycle, the most common helminthes pathogenic for humans. Laboratory diagnosis of parasitic infections. Antiparasitic drugs. Medical mycology: Medically important fungi (yeasts, dermatophytes). Laboratory methods in mycology. Antifungal drugs classifications and mechanisms of action. <i>Practical classes</i> Collection and processing of clinical specimens (swabs, blood, spinal fluid, urine, sputum, stool specimen, aspirates). Microscopic preparations and stains used in the clinical microbiology laboratory, cultivation methods, types of culture media (nonselective, selective, differential, specialized). Biochemical tests, detection of microbial antigen, detection of microbial genetic material. Laboratory diagnosis of viral infections (cultivation and detection of viruses, serologic diagnosis of viral infections, genetic analysis - detection of viral nucleic acid). Laboratory diagnosis of parasitic infections. Laboratory diagnosis of mycoses. Interpretation of laboratory results.		
Recommended literature: 1. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A., Mietzner T.A. Jawetz, Melnick &Adelberg’s Medical Microbiology,26th Ed. McGraw-Hill Companies (2013). 2.. Murray P.R., Rosenthal K.S., Pfaller M.A.. Bacterial Classification, Structure, and Replication, Medical Microbiology 7th Ed., Elsevier, (2013). 3. Milenković M., Arsenović Ranin N., Opšta i specijalna bakteriologija, Farmaceutski fakultet Univerziteta u Beogradu (2013). 4.Goering RV, Dockrell HM, Zuckerman M et. al. Mims' Medical Microbiology, 4th Edition (2008) ; 5. Greenwood D, Slack R., Peutherer J.F. : Medical Microbiology, 17th Edition, Churchill Livingstone (2007);		
The total of active learning classes		

Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Teaching, laboratory work and seminars.			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	5	Practical	
Practical classes	35	Written	60
Workshops		Oral	
Colloquia			
Seminars			
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Analytical methods evaluation in medical biochemistry			
Teachers: Kotur-Stevuljević M. Jelena			
Course status: electional			
Semester: 1		Year of studies: 1	
ECTS points: 5		Course code: 6BHDIZAEM	
Requirements: NO			
Course aims: Understanding of the general principles and requirements for analytical methods evaluation, choice and usage of the different studies for evaluation and validation of the analytical methods, selection of the statistical methods and analysis of the practical examples and techniques which are in routine laboratory usage.			
Course outcomes: Student will get knowledge and experience in methods' evaluation process, to identify factors important for method evaluation, to define the most important condition should have a particular method, according to standards, to define key characteristics of the analytical methods, to design study for method validation, to calculate and interpret results from the method evaluation procedure.			
Course contents: <i>Lectures</i> Method evaluation: importance, needs, general principles. The main characteristics of the validation procedure. Protocol design. Experimental design. Standard method verification. Analytical methods characteristics: selectivity, precision, accuracy, linearity, detection limit, quantification limit, robustness, measuring uncertainty. Validation results analysis. Statistical methods in laboratory methods evaluation. <i>Practical classes</i> Израчунавање показатеља аналитичких карактеристика метода. Анализа примера из праксе. Примена наменских софтвера. Exercises, other forms of teaching, investigation project. Calculation of the basic parameters of the analytical methods characteristics. Examples from practice analysis. Specific software usage.			
Recommended literature:			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Interactive teaching modality, practical lessons: workshops, panel discussions, tests, homework, seminars, e-learning			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia			
Seminars	20		
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Medical biochemistry II			
Teachers: Spasojević-Kalimanovska V Vesna, Ignjatović D. Svetlana, Kotur-Stevuljević M Jelena, Zeljković R. Aleksandra, Stefanović Ž. Aleksandra			
Course status: Mandatory			
Semester: II		Year of studies: I	
ECTS points: 15		Course code: 6BHDO2MB2	
Requirements: None			
Course aims: The main objective is the investigation and assessment of biochemical changes that occur in certain diseases and disorders of organs; monitoring response to therapy and applying of functional assays.			
Course outcomes: After a successfully finished course , it is expected that the student is able to understand the biochemical bases of disorders of certain organs and the role of the biochemical laboratory in the diagnosis, monitoring and treatment of the disease; successful assessment of laboratory tests and the clinical significance of the determination of biochemical parameters.			
Course contents: <i>Lectures</i> Regulation of water and electrolyte balance in body fluids and metabolism disorders. Disturbances in acid-base balance. Disturbances in the metabolism of calcium, phosphate and magnesium. Biochemical diagnosis of bone disease. The metabolism of vitamin D. Disturbances in the metabolism of muscle. Biochemical markers of kidney function. Testing of glomerular and tubular function kidney. Urinalysis. Proteinuria. Biochemical markers in liver function tests, and biliary tract. Testing of the functions of stomach disorders. Biochemical markers in the study of pancreatic exocrine function. Testing of functional disorders of the intestine. Analysis of faeces. Mechanisms of action of hormones. Biochemical parameters and functional assays in the study of the endocrine system disorders. Testing of thyroid function, gonadal, adrenal glands and systems pituitary / hypothalamus. <i>Practical classes</i> Application of functional tests for the diagnosis and monitoring of diseases of individual organs. Analysis of hormones and interpretation of results. Analysis and discussion of case studies. Problem-based learning. Application of the algorithm in the diagnosis.			
Recommended literature: 1. Burtis CA, Ashwood ER, Bruns DE (editors). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 7th Edition. St. Louis, MO: Elsevier, 2015. 2. Spasić S, Jelić-Ivanović Z, Spasojević-Kalimanovska V. Medicinska biohemija, Beograd, 2004. 3. Majkić-Singh N. Medicinska biohemija, DMBSG, Beograd, 2006. 4. McPherson RA, Pincus MR. Henry s Clinical diagnosis and menagment by Laboratory methods. 22nd edition, Elsevier, 2016. 5. Stojanov M. Laboratorijska endokrinologija, Excelsior, 2016. 6. Kaplan LA, Pesce AJ, Kazmierczak S. Clinical Chemistry, 5th Edition - Theory, Analysis, Correlation. W.B. Saunders Company, 2010. 7. Marshall WJ. Banget SK. Clinical Biochemistry, Second Edition, Elsevier, London 2008.			
The total of active learning classes			
Lectures:		Practical classes:	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Oral lectures and practical classes - interactive classes: workshops, discussions, tests, home works, seminars and e-learning.			
Grading system			
Exam prerequisites	Points	Final exam	Points


Active participation in lectures	10	Practical	
Practical classes		Written	60
Workshops		Oral	
Colloquia	15		
Seminars	10		
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTOCS		
Study programme: Biochemical diagnostocs			
Course title: Laboratory management and good laboratory practice			
Teachers: Ignjatović D. Svetlana			
Course status: Обавезни			
Semester: II		Year of studies: I	
ECTS points: 10		Course code: 6BHDO2LBM	
Requirements: none			
Course aims: Introduction to different aspects of laboratory work management, with the scientific concept of laboratory management, equipment management procedures, budget, staff and laboratory work, with laboratory management and good laboratory practice.			
Course outcomes: Application of knowledge and skills to independently or as a team member, plan, organize and manage daily activities in the laboratory, communicate in a verbal manner orally or in writing with laboratory staff, administration and service users. Apply ethical labor standards in the laboratory, and maintains the documentation, equipment and accessories necessary for the efficient, safe and professional operation of the laboratory, to manage the routine and research work of the laboratory in accordance with the standards, protocols and rules.			
Course contents: <i>Lectures</i> Different aspects of the management of the laboratory. Personnel management. Data management, documentation and laboratory records. Sampling Management. Management of laboratory equipment and accessories. Budget and Finance Management. Validation and calibration of instruments. Validation methods. Performance Measurement. Evaluation of work quality in the laboratory. Planning. Writing specifications and procedures. Detection and analysis of the problem. Safety in the laboratory. Use of computers in a laboratory. Auditing. Knowledge of ISO standards and laboratory accreditation principles. <i>Practical classes</i> Exercises, Other forms of teaching, Study research work Establishing a laboratory organization model. Methods and models calculating laboratory productivity. Creation of communication forms - presentation modes. Model of laboratory test selection. Critical assessment of diagnostic tests using a standardized checklist. Critical assessment of laboratory guides. Selection and application of standards in the laboratory. Development of quality system documents - instructions, procedures, records.			
Recommended literature: 1. Travers ME. Clinical Laboratory Management. Williams & Wilkins, 1997 2. Burnett D. A Practical Guide to ISO 15189 in Laboratory Medicine. ACB Venture Publications. 2013 3. Seiler JP. Good laboratory practice – the Why and the How. Springer, 2005 4. McPherson RA, Pincus MR. Henry's clinical diagnosis and management, 2011			
The total of active learning classes			
Lectures:		Practical classes:	
Research work:		Other forms of teaching:	
Teaching methods: Interactive theoretical and practical lessons: workshops, panel discussions, tests, homework, seminar paper, e-learning			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes		Written	60
Workshops	10	Oral	

Colloquia	20		
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Genetics			
Teachers: Potparević M. Biljana, Ninić R. Ana			
Course status: Elective			
Semester: 2		Year of studies: 1	
ECTS points: 5		Course code: 6BHDIZGEN	
Requirements: None			
Course aims: To understand the central dogma of molecular biology and to acquire knowledge about gene expression regulation. To introduce basic methods of molecular genetics and their application in diagnosis of hereditary, hematological, malignant and infectious diseases			
Course outcomes: After successfully mastering the course, the student is expected to understand and to apply the basic methods of molecular biology and cytogenetics.			
Course contents: <i>Lectures</i> Structure and properties of nucleic acids. Central dogma of molecular biology. Gene expression regulation. Genetic analysis techniques: DNA sequencing analysis, PCR analysis, hybridization techniques. Quantitative analysis of gene expression. Application of DNA analysis in prenatal diagnosis, hereditary diseases, infectious, hematological and malignant diseases. Molecular diagnostics of monogenic diseases (cystic fibrosis, Huntington's disease, hemophilia A, thrombophilia) and complex diseases. Cytogenetic analysis. Pharmacogenetics. Interpretation of genetic analysis results. <i>Practical classes</i> Exercises, Other forms of teaching, Study research work Biological material in genetic analysis. Organization of the genetic laboratory. DNA and RNA isolation methods. Electrophoretic techniques in the analysis of nucleic acids. PCR and RT-PCR techniques in molecular diagnostics. Genetic analysis of certain hereditary diseases.			
Recommended literature: 1. Matić G, Savić Pavičević D. Molekularna biologija 1. Beograd: NNK Internacional; 2011. 2. Brajušković G. Molekularna biologija 2. Beograd: Savremena administracija; 2012. 3. Burtis CA, Ashwood ER, Bruns DE (editors). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 7th Edition. St. Louis, MO: Elsevier, 2015. 4. Alberts B, Bray D, Lewis J, Raff M, Roberts K, Watson JD. Molecular Biology of the cell, Garland Publishing, Walter, 3rd edition, New York. 1994. 5. Malacinski GM. Essentials of molecular biology. Boston: Jones and Bartlett Publishers; 2005. 6. Craig H, Cohen Fix O, Green R, Greider C, Storz G, Wolberger C. Molecular Biology: Principles of Genome Functions. Oxford; 2010.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Oral lectures and practical classes - interactive classes: workshops, discussions, tests, home works, seminars and e-learning.			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	


Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia			
Seminars	20		
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical Diagnostics			
Course title: Clinical evaluation of laboratory tests			
Teachers: Bogavac Stanojević Nataša			
Course status: Elective			
Semester: 2		Year of studies: 1	
ECTS points: 5		Course code:	
Requirements: no			
Course aims: Understanding the importance of the clinical accuracy of laboratory tests and getting to know the parameters and analyzes that serve to assess clinical accuracy. Acquiring knowledge and skills necessary for the correct interpretation of the results of biochemical tests.			
Course outcomes: After a successfully mastered course, the student is expected to: know the methods of testing the clinical performance of laboratory tests; to be trained to plan and perform a clinical evaluation of biochemical markers; to perform the correct interpretation of laboratory results.			
Course contents: <i>Lectures</i> The concept of clinical precision of biomarkers. Classification of laboratory test results; errors in the classification of results. Clinical sensitivity and specificity; ROC-curve and ROC-analysis. Predictive values; diagnostic efficiency. Interpretation of laboratory test results. Reference values. Panel of laboratory tests. Clinical examples. Analysis of cost-effectiveness and effectiveness of biochemical tests. <i>Practical classes</i> Calculation of the parameters of the clinical accuracy of biochemical tests. Constructing the ROC curve. Application of dedicated software. Analysis and discussion of cases from practice. Panel discussions (clinical performance of laboratory tests and their relation to outcomes, interpretation of results of biochemical tests).			
Recommended literature: 1. Ward-Cook KM, Lehmann CA, Schoeff LE, Williams RH. Clinical Diagnostic Technology-The Total Testing Process, Volume 3: The Postanalytical Phase. AACC, 2006 2. Krzanowski WJ, Hand DJ. ROC curves for continuous data. Chapman & Hall/ CRC Press, 2009 3. Brigden ML, Heathcote JC. Problems in interpreting laboratory tests. JTE Multimedia, 2010			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Interactive theoretical and practical lessons: workshops, panel discussions, tests, homework, seminars, e-learning			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia			
Seminars	20		
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Medical biochemistry III			
Teachers: Topić Aleksandra, Spasojević-Kalimanovska V Vesna, Kotur-Stevuljević M Jelena, Vekić Jelena, Spasić Slavica, Ignjatović D. Svetlana			
Course status: Mandatory			
Semester: III		Year of studies: II	
ECTS points: 10		Course code: 6BHD03MB3	
Requirements: None			
Course aims: The study and measurement of biochemical changes occurring in specific physiological conditions and diseases; monitoring of applied therapy and clinical application of functional tests.			
Course outcomes: After a successfully mastered course, the student is expected to: understand the biochemical base of specific physiological conditions, disorder of certain organs and the role of the biochemical laboratory in diagnostics, monitoring and treatment of the disease; gain skills to evaluate the laboratory tests and to assess the clinical significance of biochemical parameters.			
Course contents: <i>Lectures</i> Biochemical aspects of nutrition. Biochemical markers of nutritional status. Metabolic disorders in starvation. Examination of metabolic disorders in obesity. Metabolic syndrome. Micronutrients. Biochemical markers of vitamin deficiency. Specificity of biochemical diagnostics in geriatrics. Biochemistry in paediatrics and neonatology. Biochemical markers in pregnancy. Biochemical analysis in in vitro fertilization. Amnion fluid. Sperm analysis. Perinatal laboratory analyses. Biochemical analysis of various body fluids: liquor, transudates, and exudates, peritoneal fluid, synovial fluid and saliva. Tumour markers. Quality of biological material; quality of the analytical process; quality of obtained results. Interferences in laboratory testing. Automation and computerization of the pre-analytical, analytical and post-analytical phase of the medical-biochemical laboratory. Point-of-care testing (POCT): regulation, protocols, testing technology, advantages and limitations. <i>Practical classes</i> Application of functional tests for diagnosis and monitoring of diseases of certain organs. Point-of-care analysis. Proteomics analysis. Nanotechnology. Analysis and discussion of cases from practice. Problem-based learning. Application of algorithms in diagnostics.			
Recommended literature: 1. Burtis CA, Ashwood ER, Bruns DE. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics; Elsevier; 5th ed (2012). 2. Marshall WJ, Lapsley M, and Bangert SK. Clinical Chemistry, Mosby; 6th ed (2008).			
The total of active learning classes			
Lectures:		Practical classes:	
Research work: 15		Other forms of teaching: 15	
Teaching methods: lectures, practical work, interactive teaching, workshop, panel discussions, tests, homework, seminars, e-learning.			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes		Written	60
Workshops		Oral	
Colloquia	20		

Seminars		
Other activities		

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Data analysis and results of the investigation publishing			
Teachers: Vekić Z. Jelena, Kotur-Stevuljević M. Jelena			
Course status: obligatory			
Semester: 3		Year of studies: 2	
ECTS points: 5		Course code: 6BDHOZOBP	
Requirements: NO			
Course aims: Understanding of the concept of the statistical design, analytical procedure, results presentation and interpretation, recognition and elimination of different error types, significance tests conduction, learning of the oral and written results presentation techniques			
Course outcomes: Student will know to choose appropriate statistical test, to estimate sample size influence on statistical significance, to perform different inferential statistical tests, control quality procedure, to present results of the investigation, to prepare and write article for oral presentation and for publication in professional and scientific journals.			
Course contents: <i>Lectures</i> Basic statistical terminology, statistical parameters, parameters transformation. Statistical tests (parametric, nonparametric). Accuracy and precision of laboratory measurements. Association analysis (regression and correlation analysis), implementation in laboratory results. Quality control in biochemical laboratory. Results presentation, oral and written. <i>Practical classes</i> Exercises, Other teaching methods, Investigation project. Statistical package use for solving routine laboratory problems. Critical analysis of the journal articles.			
Recommended literature: 1. Peat J, Barton B. Medical statistics – A guide to data analysis and critical appraisal. Blackwell Publishing, 2005. 2. Zhou XH, Obuchowski N, McClish DK. Statistical methods in diagnostic medicine. Wiley-Interscience, 2011 3. Tamhane AJ, Dunlop DD. Statistics and data analysis. Prentice Hall Inc. 2000 4. Murrey R. Writing for academic journals. Open University Press, McGraw-Hill, 2005 5. Hall GM. How to write a paper. BMJ Publishing Group, 2003 6. Peat J, Elliott E, Baur L, Keena V. Scientific Writing: Easy When You Know How. BMJ Books, 2002.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Interactive theoretical and practical teaching: workshops, panel discussions, tests, homework, seminars, e-learning			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia			
Seminars	20		
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical Diagnostics			
Course title: Application of economic methods in laboratory diagnostics			
Teachers: Bogavac Stanojević Nataša			
Course status: Elective			
Semester: 3		Year of studies: 2	
ECTS points: 5		Course code: ББХДИЗПЕТ	
Requirements: no			
Course aims: Introduction to the basic principles of economic evaluation of laboratory tests. Acquiring knowledge necessary for implementation of economic analysis in laboratory practice			
Course outcomes: Application of cost effectiveness methods in economic evaluation of new and existing laboratory tests. Estimation of cost and effectiveness of laboratory tests. Students will understand how to reduce laboratory costs			
Course contents: <i>Lectures</i> Evaluation of laboratory tests effectiveness. Types of costs. Costs calculation. Estimation of health benefits. QALY calculation. Cost minimization analysis. Cost-effectiveness analysis. Cost-benefit and cost - utility analysis. Decision tree. Sensitivity analysis. <i>Practical classes</i> Calculation of NNS and parameters of the effectiveness of biochemical tests. Constructing the decision tree. Application of dedicated software. Analysis and discussion of cases from practice.			
Recommended literature: Atanasijević D. (Editor of the translated edition of the book) "Research outcomes of therapeutic and diagnostic devices", Association ISPOR Serbia, 2015 2. Drumond M, et al. Methods for the Economic Evaluation of Health Care Programs. Oxford University Press, 1997 3. Zah V, Atanasijevic D, Bogavac-Stanojevic N. and associates (editors of the translated edition of the book) "Costs, quality and outcomes of health care-IPOR Book of Terms", Association Ispor Srbija, 2011.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Interactive theoretical and practical lessons: workshops, panel discussions, tests, homework, seminars, e-learning			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	15	Written	40
Workshops	15	Oral	
Colloquia			
Seminars	20		
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized academic study BIOCHEMICAL DIAGNOSTICS		
Study programme: Biochemical diagnostics			
Course title: Laboratory diagnostics of immune disorders			
Teachers: Bufan S. Biljana, Arsenović Ranin M. Nevena, Stojić-Vukanić M. Zorica			
Course status: Elective			
Semester: 3		Year of studies: 2	
ECTS points: 5		Course code: 6BHD13	
Requirements:			
Course aims: To provide knowledge about pathogenesis of the diseases caused by dysfunction of the immune system, and immune parameters and tests used for their diagnosis and monitoring.			
Course outcomes: After completing the course, students are expected to know pathogenesis of immune disorders, and immune parameters and tests used for their diagnosis and monitoring.			
Course contents: <i>Lectures</i> Diseases caused by the dysfunction of immune system. Immediate hypersensitivity: etiology, pathogenesis, clinical manifestations, diagnosis. Etiology, pathogenesis and diagnosis of autoimmune diseases of: endocrine system, nervous system, liver, skin, gastrointestinal tract and kidney. Etiology, pathogenesis and diagnosis of: connective tissue diseases, autoimmune hematological disorders and immunoproliferative diseases. Immunodeficiency: primary and secondary (acquired immunodeficiency syndrome, AIDS). <i>Practical classes</i> In vitro and in vivo tests for diagnosis of immediate hypersensitivity. Immune/immunochemical tests for diagnosis and monitoring of autoimmune and immunoproliferative diseases. Tests that are used for diagnosis of immunodeficiencies. Immunomonitoring of HIV+ patients.			
Recommended literature: 1. Abbas AK, Lichtman A, Pillai S. Cellular and molecular immunology. 9th ed. Philadelphia: Elsevier Saunders; 2018. 2. Rich RR, Fleisher TA, Shearer WT, Schroeder HW, Frew AJ, Weyand CM. Clinical immunology principles and practice. Elsevier Saunders, Philadelphia, PA, USA, 4th ed. 2013. 3. Dorrestyn Stevens DS. Clinical Immunology & Serology A Laboratory Perspective. FA Davis Company, Philadelphia, PA, USA, 3rd ed. 2010. 4. Zabriskie JB. Essential Clinical Immunology. Cambridge University Press, Cambridge, UK, 2009. 5. Spickett G. Oxford Handbook of Clinical Immunology and Allergy. Oxford University Press, 2013.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, seminars, workshops, case studies.			
Grading system			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	10	Practical	
Practical classes	10	Written	60
Workshops		Oral	
Colloquia	20		

Seminars		
Other activities		