DISCIPLINE SHEET

ACADEMIC YEAR

2022- 2023

1. DATA ABOUT THE STUDY PROGRAM

1.1 Institution of higher education	UNIVERSITY OF MEDICINE AND PHARMACY OF CRAIOVA
1.2 Faculty	**MEDICINE**
1.3 Department	2
1.4 Study Domain	HEALTH
1.5 Study cycle	LICENCE
1.6 Study program/ Qualification	MEDICINE

2. DATA ABOUT THE DISCIPLINE

2.1 DISCIPLINE NAME	**BIOCHEMISTRY**				
2.2. Discipline code	MED11204				
2.3 The holder of course activities	Dricu Anica, Sandu Raluca Elena, Popescu Ştefana-Oana, Tache Daniela- Elise				
2.4 The holder of seminar activities	Dricu Anica, Sandu Raluca Elena, Popescu Ştefana-Oana, Tache Daniela-Elise, Artene Ştefan-Alexandru, Roxana Surugiu, Pîrvu Silvia Andreea, PhD Student Burdusel Daiana, PhD Student Ruscu Mihai				
2.5. Academic degree	Prof., Lecturer, Assoc. Prof., Assist. Prof.				
2.6. Employment (base norm/associate)	base norm				
2.7. Year of study	**I**	2.8. Semester	**I** **II**	2.9. Course type (content) 2.10. Regime of discipline (compulsoriness)	**CFD**

3. TOTAL ESTIMATED TIME (teaching hours per semester)

Ist SEMESTER

3.1 Number of hours per week	**6**	3.2 From which - course	**3**	3.3 seminary/laboratory	**3**
3.4 Total hours in curriculum	**84**	3.5 From which - course	**42**	3.6 seminary/laboratory	**42**
Time found distribution (hours):					
Study by manual, course support, bibliography, and notes					**9**
Additional documentation in the library, specialized electronic platforms and on the field					**8**
Training seminars / labs, homework, reports, portfolios, and essays					**8**
Tutoring					**2**
Examinations					**4**
Other activities, counselling, student circles					**10**

3.7 Total hours of individual study	**41**
3.9 Total hours per semester	**125**
3.10 Number of credits	**7**

IInd SEMESTER

3.1 Number of hours per week	**5**	3.2 From which - course	**3**	3.3 seminary/laboratory	**2**
3.4 Total hours in curriculum	**70**	3.5 From which - course	**42**	3.6 seminary/laboratory	**28**
Time found distribution (hours):					
Study by manual, course support, bibliography, and notes					**12**
Additional documentation in the library, specialized electronic platforms and, on the field					**5**
Training seminars / labs, homework, reports, portfolios, and essays					**4**
Tutoring					**2**
Examinations					**4**
Other activities, counselling, student circles					**3**

3.7 Total hours of individual study	**30**
3.9 Total hours per semester	**100**
3.10 Number of credits	**4**

4. PREREQUISITES (where appropriate)

4.1 curriculum	Students must have basic knowledge of chemistry and biology
4.2 competency	

5. CONDITIONS (where appropriate)

5.1. of curse deployment	- Lecture Hall with projector / online
5.2. of seminary/ lab deployment	Biochemistry Lab / online / Prepare in advance of the laboratory by individual study

6. SPECIFIC COMPETENCES ACCRUED	
PROFESSIONAL COMPETENCES	**C1 –** To be able to identify the illness and to determine the correct diagnosis of the disease (diseases). **C4 –** To address the health problems from the perspective of community particularities, demonstrating knowledge of community factors that influence individual, community and public health, **C5 -** To initiate and conduct scientific research
TRANSVERSAL COMPETENCES	**CT1 -** Autonomy and responsibility: • acquisition of moral guidelines, professional and civic skills that enable students to be fair, honest, non-confrontational and cooperative; • to respect and to develop the moral and professional ethics values, to have the capacity to understand and integrate ethical and moral dimensions of healthcare **CT2 -** Social interaction: • understanding, non-discrimination and respect for diversity and multiculturalism; • to demonstrate communication and interpersonal skills and strategies that result in respectful, compassionate and effective information exchange and decision making with patients, families, members of the healthcare team, and other colleagues. • get involved in volunteering, • to have knowledge about the essential health problems of the community. **CT3** - Personal and professional development: • be open to lifelong learning; • appreciate the need for individual study as the basis of personal autonomy and professional development; • to demonstrate the ability to accurately assess and improve theoretical and practical performance, as well as to acquire, appraise, and apply scientific evidence to clinical activities and patient care.; • know how to use information and communication technology.

7. DISCIPLINE OBJECTIVES (based on the grid of specific competences acquired)

7.1 The general objective of the discipline	To give the students the general knowledge about the biochemical characteristics of the constituents of the living organisms To help the students to accumulate the required knowledge for understanding of the vital processes and metabolic transformations occurring in living organisms in correlation with their Physiological and pathological mechanisms
7.2 The specific objectives of the discipline	- Accumulation of the basic knowledge required for understanding of the biochemical mechanisms involved in various body functions; - Understanding the causes and rational treatments of many diseases; - Understanding the mechanism of action of the drugs; - Accomplishment of knowledge regarding choice of type of tests and methods used for the laboratory investigation required for proper evaluation of health. The students are expected to: - acquire a strong basis in biochemistry knowledge, to understand the concepts and the fundamental truth in the biochemistry area. - have the capacity to use the knowledge acquired during the course in solving both quantity and quality problems in the domain of biochemistry. - be able to argue coherently within the academic language of their respective disciplines and to explain their ideas in lay language to those based in other disciplines, to manipulate ideas, and to express them confidently to others. - have the capacity to evaluate and synthesize the biochemical informations and data. After taking the course, the students: - should be able to analyze and evaluate their own and other's work, and present the results both orally and in writing in a clear and professional way - are expected to acquire a strong basis in clinical biochemical investigations that are routinely used in the clinical laboratory - are expected to have the capacity to understand the importance of providing additional time for professional development and to have the attitude necessary to perform at a level of excellence in their jobs. - should be able to search and to understand new knowledge in biochemistry. - should be able to understand the following concepts: work with a group of a people as a team, work independently, inter- and intra-disciplinary collaboration. - should be able to understand the importance of human factors in their work. ATTITUDES: • to be open to acquire moral guidelines, training of professional and civic attitudes that enable students to be fair, honest, non-confrontational, cooperative and understanding in the face of suffering, available to help people interested in the developer community; • to know, respect and contribute to the development of moral values and professional

	ethics; • to learn recognizing a problem and to provide responsible solutions in order to solve them. • to recognize and to respect the diversity and multiculturalism; • to learn to develop teamwork skills; • to be able to communicate requirements orally and in writing, working methods, results, consult with the team; • get involved in volunteering, to know the essential problems of the community; • be open to lifelong learning, • to appreciate the need for individual study as the basis of personal autonomy and professional development; • to exploit their optimum potential; • to know how to use information and communication technology; • to have initiative to engage in educational activities and scientific discipline.

8. CONTENTS

8.1 Course (content units)	Hours
B1C.1. Biochemistry as science. Biochemistry and its relations with other biological sciences, actual developing directions.	**3**
B1C.2. Components of human body. Water and bioelements. Structural characteristics, daily necessary, biological importance of water, macro- and microelements.	**3**
B1C.3. Aminoacids, peptides, proteins. Classification, structure, properties and biological functions of different proteins. Relation between structure and function for collagen, keratin, actin, miozin, immunoglobulins, elastin. General principal for protein studies. Notions of proteomics. Chromoproteins, metaloproteins, phosphoproteins.	**9**
B1C.4. Enzymes. Main features of enzymes. Distribution in tissues and organs. Intracellular localization. Enzyme structure. Coenzymes. Enzyme classification. Izoenzymes. Enzyme specificity. Factors affecting the rate of enzyme-catalyzed interaction. Enzyme kinetic. Biological mechanisms in different enzymopathies. Enzyme inhibition. Drugs as enzyme inhibitors. Regulation of enzymes activity.	**6**
B1C.5. Vitamins. Watersoluble and liposoluble vitamins: structure, absorption, transport, biological functions, antagonists and deficiencies. Relation vitamins-enzymes.	**3**
B1C.6. Sugars. Structure and biological functions of most important sugars for human body. Glycosaminoglycans. Glycoconjugates.	**3**
B1C.7. Lipids. Structure and biological functions of the most important lipids from human body: fatty acids, acylglycerols, sterides, glycerophospholipide, sphingolipids, glycolipids, lipoproteins	**6**
B1C.8. Nucleotides and nucleic acids. Structural components and biological functions of nucleotides. Synthesis analogs and their application in therapy. DNA: primary and secondary structures, biochemical importance. DNA replication, mutations. Types of RNA. Biochemical importance.	**6**
B1C.9. Short presentations according to lectures topics.	**3**
B2C.1. Oxidative metabolism and bioenergetics. Bioenergetics, endergonic, exergonic and coupled reactions. General transforming pathways of biological components. Macroergic compounds. Synthesis pathways of ATP: substrat phosphorilation, respiratory chain, and oxidative phosphorylation.	**3**
B2C.2. Carbohydrate metabolism. Digestion and absorption of glucids. Glycolysis. Citric acid cycle. Pentose phosphate pathway. Uronic acid pathway. Gluconeogenesis. Metabolism of glycogen. Physiopathology of carbohydrate methabolism: diabetes, fructosemy, galactosemy.	**6**
B2C.3. Lipid metabolism. Digestion and absorption of lipids. Lipid transport. Metabolism of fatty acids. Metabolism of acylglycerols. Metabolism of ketone bodies. Metabolism of glycerophospholipids and sphingolipids. Metabolism of cholesterol. Physiopathology of lipid metabolism: atherosclerosis, hyperlipoproteinemia. Eicosanoids: prostaglandins, leukotrienes, thromboxanes (structures and biological functions).	**9**
B2C.4. Protein and nucleic acids metabolism. Protein digestion and absorption of aminoacids. General metabolism of aminoacids. Metabolic pathways for transformation of: serine, cysteine, phenilalanine, triptophane, tyrosine, arginine, glutamic acid, aspartic acid, methionine. Genetic defects of aminoacids metabolism. Metabolism of purine and pyrimidine nucleotides. Biosynthesis of nucleic acids. The genetic code. Protein biosynthesis. Post- translation processing. Inhibition of nucleic acids and proteins biosynthesis by chemotherapy. Hemoglobin metabolism. The pathology of hemoglobin metabolism.	**12**
B2C.5. Hormones. Hierarchy of the endocrine system. Hormones: structures, biological functions, pathology, mechanism of action. Hormonal receptors.	**6**
B2C.6. Biochemical aspects in malignant diseases. Tumor markers. Characterization, classification and significances for diagnosis.	**3**
B2C.7. Short presentations according to lectures topics	**3**

BIBLIOGRAPHY 1. Anica Dricu, ŞO Purcaru, DE Tache, S Dănoiu, Elemente de Biochimie, Editura Medicală Universitară Craiova, 2009 2. Aurel Popa. Biochimie medicală. Sitech, Craiova, 2019, ISBN: 606-11-6672-5 3. Aurel Popa, Ana-Maria Buga, Biochimie Medicală. Electroliţi, Biomolecule, Biopolimeri. Note de curs pentru studenţii facultăţilor de medicină. Sitech, Craiova, 2009, ISBN: 978-606-11-0533-5 4. Aurel Popa, Buga Ana-Maria. Metabolisme. Biochimie integrativă. Note de curs pentru studenţii facultăţilor de medicină. Sitech, ISBN 978-973-671-196-1 5. V. Dinu, E. Truţia, E. Popa-Cristea, A. Popescu. Biochimie medicală (mic tratat). Editura medicală, Bucureşti, 1996 6. Boyer, Rodney. Concepts in Biochemistry. Pacific Grove, CA: Brooks/Cole Publishing Company, 1999. 7. Lodish, H., et. al. Molecular Cell Biology, 4th ed. New York: W. H. Freeman & Co., 2000 8. David L. Nelson, Michael M. Cox, Principles of Biochemistry, Ed. Lehninger, 2012 9. Miriam D. Rosenthal, Robert H. Glew Medical Biochemistry: Human Metabolism in Health and Disease, 2009, ISBN: 978-0-470-12237-2; 10. Löffler/Petrides Biochemie und Pathobiochemie, 2014 11. Marks'Basic Medical Biochemistry: A Clinical Approach, Fourth Edition, Michael Lieberman, PhD, Allan D. Marks, MD, 2012	
8.2 Practical work (topics / themes)	
B1P.1. Principles and fundamental procedures in biochemistry laboratory. Safety work in the laboratory. Physico-chemical methods used for usual biochemical determination. Characterisation of biological materials: blood, urine, tissue extracts: composition, prelevation, storage. Factors that affect the results of analysis. Standards and control serum. Reference ranges.	**9**
B1P.2. Aminoacids, peptides, proteins. Identification of aminoacids and proteins. Protein denaturation. Methods for the assessment of proteins from biological fluids. Separation and purification of aminoacids and proteins (thin layer chromatography, gel filtration, agarose and polyacrylamide electrophoresis, immunoelectrophoresis). Plasmatic aminoacids and proteins. Disproteinemia.	**9**
B1P.3. Enzymes. Catalytic effect of enzymes. Enzyme's specificity. Factors affecting the rate of enzyme reactions. Determination of K_M. Oxidoreductases. Transferases. Hydrolases. Distribution in tissues and organs. Izoenzymes. Separation of lactate dehydrogenase isoenzymes. The importance of enzymatic diagnosis in: cardiac, hepatic, scheletal-muscle, bone disorders and malignancy.	**12**
B1P.4. Investigation of acid-base balance. Analyses of blood gases and pH. Determination of plasma bicarbonate.	**3**
B1P.5. Investigation of hydro-electrolytes metabolism. Determination and clinical significance of osmolality. Clinical significance of electrolytes determination: sodium, potassium, chloride. Methods for assessment of electrolytes in biological fluids.	**3**
B1P.6. Vitamins. Identification and methods for assessment of vitamins. Recovery of practical works.	**6**
B2P.1. Investigation of carbohydrate metabolism. Identification of sugars. Methods for the assessment of glucose and glucose catabolites (piruvic acid, lactic acid). Safety work in the laboratory.	**4**
B2P.2. **Investigation of lipid metabolism.** Identification of lipids (glycerol, cholesterol, bile salts). Methods for the assessment of cholesterol, triacylglycerols, phospholipids. Methods for lipids and lipoproteins separation.	**4**
B2P.3. Investigation of proteins and hemoglobin metabolism. Methods for the assessment of protein catabolites: urea, creatinin, uric acid, bilirubin. Physio-pathological significance of hemoglobin, bilirubin and iron.	**8**
B2P.4. Clinical significance of biochemical determination in pathological disease: determination of calcium, magnesium and phosphorus.	**2**
B2P.5. Investigation of nucleic acids metabolism. Methods for separation and assessment of nucleic acids: PCR. Physiopathology of purine metabolism. The assessment of uric acid.	**2**
B2P.6. Investigation of hepato-biliary function. Bile characterization. Tests used for liver diseases.	**2**
B2P.7. Investigation of renal function. Urine analysis. Normal and abnormal composition and features. Urine sediment Significance of clearance determination for the assessment of renal function.	**2**
B2P.8. Tests for endocrine diseases. Identification and assessment of hormones (thyroid, pancreatic, steroid hormones). Recovery of practical works	**4**

BIBLIOGRAPHY

1. Laboratory protocol.
2. Ghid pentru lucrări practice de Biochimie -metabolisme, Ștefana Oana Popescu, Daniela Elise Tache, Ștefan Alexandru Artene, Florentina Șerban, Anica Dricu, ISBN 978-606-94885-6-0, 2021
3. Laborator clinic I, Ediţie revăzută, V. Darie, Margareta Grigorescu, Cătălina Pisoschi, D. Firu, Oana Popescu, Reprografia U. M. F. Craiova, 2004
4. Laborator clinic II, Ediţie revăzută, V. Darie, Margareta Grigorescu, Cătălina Pisoschi, D. Firu, Oana Popescu, Reprografia U. M. F. Craiova, 2004
5. Principles of Biochemistry, Ed. Lehninger, David L. Nelson, Michael M. Cox, 2012
6. Fundamentals of Clinical Chemistry and Molecular Diagnostics, Carl A. Burtis, David E. Burtis Tietz, Seventh Edition, 2014

9. CORROBORATING THE DISCIPLINE CONTENT WITH THE EXPECTATIONS OF EPISTEMIC COMMUNITY REPRESENTATIVES, PROFESSIONAL ASSOCIATIONS AND EMPLOYEE REPRESENTATIVES RELATING TO THIS PROGRAM

- The discipline of biochemistry is a fundamental discipline, mandatory for a student to become a doctor
- The knowledge, practical skills and attitudes learned in this discipline provide the basis for the study of pathological processes that will be detailed in other disciplines and are the basis for understanding and learning any preventive, diagnostic, curative or recovery medical act

10. MHETODOLOGICAL LANDMARKS

Types of activity	Teaching Techniques / learning materials and resources. In case of special situations (alert states, emergency conditions, other types of situations that limit the physical presence of people) the activity can be carried out online using computer platforms approved by the faculty/university. The online education process will be adapted accordingly to ensure the fulfilment of all the objectives set out in the subject sheet
Course	Lectures, debate, explanation, Problem Based Learning, active participation methods, individual and group learning, using audio-visual materials as a teaching method syllabus and bibliography coverage. For online activities lectures will be adapted using computer platform of the university
Practical work	Explanation, problem-based learning, individual and group learning, experimental work, research work. For online activities practical work will be adapted using computer platform of the university including video description of the experiments
Individual study	Before each course and each practical work

11. RECOVERY PROGRAM

	No. absences that can recover	**Place of deployment**	**Period**	**In charge**	**Scheduling of topics**
Absences recoveries	3	Biochemistry lab/ online	The last week of the semester	Practical work holder	According to the internal schedule
Schedule consultations / Students' Scientific Circle	2 hours/ week	Biochemistry lab / online	Last two weeks	Practical work holder	According to the internal schedule
Program for students poorly trained	4 hours/ sem.	Biochemistry lab / online	Last two weeks	Practical work holder	According to the internal schedule

12. ASSESMENT

Activity	**Types of assesment**	**Methos of evaluation**	**Percentage from final grade**
Lecture	Formative assesment during the semester Summative assesment during the exam	Written exam/ oral exam Multiple choice test using online platform	**75%**
Practical work	Formative assesment during the semester Periodic assesment during the semester, Summative assesment during the exam	During written exam / Multiple choice test using online platform	**15%**
Periodic assesment			5%
Assement of individual activities			5%

Minimum performance standard	at least 50% for each component of the evaluation

13. GUIDANCE AND COUNSELLING PROGRAMS		
Professional guidance and counselling programs (2 hours/monthly)		
Scheduling the hours	**Place of deployment**	**In charge**
Last Friday of the month between 12 and 14 o'clock	Seminar hall, 2rd floor	All teachers responsible for the lectures /practical work

Endorsement date in the department: 27.09.2022

Department Director,	**Coordinator of study program,**	**Discipline holder,**
Prof. Eugen OSIAC	**Prof. Marius Eugen CIUREA**	**Prof. Anica DRICU**