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| **Course ID: HOB401** | **Course name: BIOCHEMISTRY OF XENOBIOTICS** | | |
| **Cycle: FIRST** | **Year: FOURTH** | **Semester: VIII** | **ECTS credits: 3** |
| **Course status: ELECTIVE** | | **Total course hours: 45**<br>Lectures: 30<br>Laboratory: 15 | |
| **Teaching participants:** | **Teachers and associates with expertise in the field to which the subject belongs** [do not enter names in this section. Leave the wording as indicated in this section] | | |
| **Prerequisite for enrollment:** | None. | | |
| **Course aims:** | The aim of the course is to introduce students with enzymes, chemical and biological changes and effects of drugs, xenobiotics and endobiotics on the human and animal organism as a result of metabolic processes. | | |
| **Thematic course units:** | 1. Introduction to biochemistry of drugs, metabolism and biotransformation of xeno-and endobiotics. The anatomic localization of xenobiotic metabolism.<br>2. Consequences of xenobiotic metabolism: pharmaclogical, toxicological, pharmacokinetic and clinical aspects<br>3. Phase I reactions (bio-oxidation, bio-reduction, hydrolysis and other reactions)<br>4. Phase II reactions (methylation, conjugation with amino acids, acetylation, sulfation, glucuronidation, conjugation with glutathione)<br>5. Drug metabolism in children – the ontogenesis of drug metabolizing enzymes in the pediatric population<br>6. Stereoselectivity<br>7. Prodrugs<br>8. Transport systems (P-glycoprotein, MRP-carriers, BCRP, LRP, others)<br>9. Induction and inhibition in biotransformation<br>10. Factors affecting drug metabolism: species, gender, genetic factors, environmental factors, stress, nutrition, age, diseases, specific characteristics of tissues and organs, dosage<br>11. Metabolic drug-drug interactions, drug - chemicals interactions<br>12. Pharmacogenomics and the development of personalized medicine<br>13. Biotransformation and biological effects of endo-and xenobiotics, kinetic approach to factors affecting biotransformation<br>14. Drug development – *in vitro* and *in silico* tools that predict the drug metabolism | | |

**Learning outcomes:**

Knowledge: Students will be able to describe the fundamental principles and importance of xenobiotic metabolism, explain the role of prodrugs, pharmacogenomics and in vitro tools in current drug research.

Skills: Students will analyze the main reactions and key enzymes in biotransformation of xenobiotics and link chemical structures of drugs with their pharmacological effects.

Competences: Based on the acquired knowledge, students will be able to predict interactions between drugs, the impacts od different factors on the bioactivity of xenobiotics and to identify the role of metabolism in the development of new drugs.

**Teaching methodology:**

Auditory lectures and theoretical exercises.

**Assessment methods and grading system[1]:**

Grading criteria

| | Criteria | Maximal score | Required score |
|---|---|---|---|
| 1. | Class attendance | 5 | 3 |
| 2. | Class activities | 10 | 5 |
| 3. | Midterms | 45 | 25 |
| 4. | Final exam | 40 | 22 |
| | Total | 100 | 55 |

Scores and grading

| Score | Grade (B&H) | Grade (ECTS) |
|---|---|---|
| < 55 | 5 | F, FX |
| 55–64 | 6 | E |
| 65–74 | 7 | D |
| 75–84 | 8 | C |
| 85–94 | 9 | B |
| 95–100 | 10 | A |

**Literature[2]:**

Mandatory literature:

1. Timbrell, J.A. (1991) Principles of Biochemical Toxicology. 2nd ed., Taylor & Francis; London, Washington DC.
2. Rendić, S., Medić-Šarić, M. (2013) Metabolizam lijekova i odabranih ksenobiotika, Medicinska naklada, Zagreb.
3. Mehmedagić, A. (2002) Farmakokinetika sa osnovama biofarmacije. 1st ed., Sarajevo Publishing; Sarajevo.

[1] The grading structure for each subject is determined by the Council of the organizational unit before the beginning of the academic year in which the subject is taught as per Article 64, paragraph 6 of the Law on Higher Education of Sarajevo Canton

[2] The Senate of the higher education institution, as an institution, or the Council of the organizational unit of the higher education institution, as a public institution, determines by a special decision, which is published on its website before the beginning of the academic year obligatory, mandatory and recommended textbooks and manuals, as well as other recommended literature based on which exams are prepared and taken as per Article 56, paragraph 3 of the Law on Higher Education of the Sarajevo Canton

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| | Supplementary literature:<br><br>1. Foye, W.O., Lemke, T.L., Williams, D.A. (1995) Principles of Medicinal Chemistry. 4th ed., Williams & Wilkins; Baltimore,Hong Kong,Munich,Tokyo.<br>2. Coleman, M.D., (2020) Human drug metabolism. John Wiley & Sons.<br>3. Testa, B. and Krämer, S.D. (2006) The biochemistry of drug metabolism–an introduction: part 1. principles and overview. *Chemistry & biodiversity*, *3*(10), pp.1053-1101. |