General enzymology (1nd Year, 2rd Semester)

Credit value (ECTS): 3

Course holder:
Lecturer dr. Elena TODIRAŞCU-CIORNEA

Discipline objectives (course and practical works)
The general objective of the discipline is to acquire and understand the theoretical basis specific to General Enzymology, the skills to apply theoretical knowledge in practice, and training the ability to act autonomously to observe, analyze, interpret and provide solutions to problems in biotechnology.
As specific objectives, the discipline of General Enzymology, according to the analytical program, aims to:

- familiarizing students with general notions regarding the nomenclature, classification and structure of enzymes and, respectively, of enzymatic cofactors;
- the acquisition by students of the notions of enzymatic kinetics, of the mechanisms for regulating the activity of enzymes, as well as notions regarding the concept of immobilized enzyme, the determination of the optimal immobilization conditions and the practical use of immobilized enzymes;
- knowledge and understanding of all factors and processes that influence enzymatic activity;
- acquiring some general notions regarding the practical applicability of some categories of organisms and enzymes that they produce in various fields of industrial activity or fundamental research.

Content (syllabus)

Course (chapters / subchapters)
Introduction. Brief history of the development of enzymology. General properties of enzymes (reaction specificity, substrate specificity).
Nomenclature and classification of enzymes: - characterization of the oxido-reductase class; examples - characterization of the transferase class; examples - characterization of the hydrolase class; examples - characterization of the class of ties; examples - characterization of the isomerase class; examples - characterization of the class of ligases (synthetases); examples
Chemical structure of enzymes: - Structural organization of enzymes (one-component enzymes; two-component enzymes); - Active center of enzymes; - Allosteric center. Allosteric enzymes; - Multienzymatic complexes; - Structural domains.

Coenzymes: chemical structure; the role of coenzymes in enzymatic catalysis. - Coenzymes of aliphatic nature - Coenzymes of aromatic nature - Coenzymes of heterocyclic nature - Coenzymes of nucleoside and nucleotide nature
Kinetics of enzymatic reactions (General notions of enzymatic thermodynamics; Influence of physicochemical factors on the rate of enzymatic reactions)
Mechanisms of regulation of enzymatic activity
Isoenzymes: definition; classification of isoenzymes; the biological role of isoenzymes.
Regulation of enzyme activity
Use of enzymatic markers in immunoassay

Practicum
Presentation of the Enzymology laboratory: labor protection rules; laboratory apparatus and utensils; good laboratory work practices.
Comparison of the action of chemical catalysts and enzymes
Study of the substrate specificity of enzymes
Enzymatic kinetics: Influence of incubation medium temperature on the rate of enzymatic reactions; Influence of the pH of the incubation medium on the rate of enzymatic reactions; Influence of substrate concentration on the rate of enzymatic reactions; Influence of enzyme concentration on the rate of enzymatic reactions; Study of the effect of irreversible and reversible inhibitors on enzymatic activity; The influence of activators on the rate of enzymatic reactions.
Obtaining and characterizing enzyme preparations from different sources. Activity determination of some enzymes.

Bibliography

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3. Cojocaru, D. C., Mariana Sandu, 2004 - *Biochimia proteinelor şi acizilor nucleici*, Ed. PIM, Iaşi.
4. Cojocaru, D.C., Toma, O., Sabina Ioana Cojocaru, Elena Ciornea – 2009, *Practicum de biochimia proteinelor si acizilor nucleici*, Ed. Tehnopress, Iasi
5. Cojocaru, D.C., Zenovia Olteanu, Elena Ciornea, Lăcrămioara Oprică, Sabina Ioana Cojocaru, 2007 - *Enzimologie generală*, Ed. Tehnopress, Iaşi
6. Copeland Robert A., 2000 - *Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis*, Wiley-VCH Inc., ISBN 0-471-35929-7
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8. Dima, L., 1999 – *Enzime imobilizate*. Ed. Mirton, Timişoara
9. Dronca Maria, 2002 - *Enzime: cofactori enzimatici : note de curs*, Ed. Medicala Universitara "Iuliu Hatieganu", ISBN 9738019915, 9789738019911
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11. Kazmierczak, S., Azzazy, M. E. H., 2014 - *Diagnostic Enzymology* (ISBN: 978-3-11-020724-8, e-ISBN: 978-3-11-022780-2), Ed. Walter de Gruyter GmbH, Berlin.

Final evaluation

Type of evaluation	Methods of evaluation	Percentage of the final grade
Colloquium	Written examination	70%
Assessment of the activity during the semester	Oral evaluation during the semester, verification tests, laboratory colloquium	30%

Contact person

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