R O M Â N I A
MINISTERUL EDUCAȚIEI ȘI CERCETĂRII
Universitatea din Craiova
FACULTATEA DE ȘTIINȚE/ DEPARTAMENTUL DE CHIMIE
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Subject Description

1. Program information

1.1. Institution	University of Craiova
1.2. Faculty	Science
1.3. Department	Chemistry
1.4. Study field	Chemistry
1.5. Study level	Master
1.6. Type of education	full-time
1.7. Study program	Advanced Chemistry

2. Subject information

2.1. Subject			**Advanced biochemistry**				
2.2. Course coordinator			Lect. dr. Catalina Ionescu				
2.3. Application coordinator			Lect. dr. Catalina Ionescu				
2.4. Year of study	I	2.5. Semester	2	2.6. Type of evaluation	V	2.7. Subject type	DS/DOB

3. Total estimated tipe (hours/semester)

3.1. Number of hours per week	3	from which: 3.2 course	1	3.3. seminar/lab	2
3.4. Total hours in curriculum	42	from which: 3.5 course	14	3.6. seminar/lab	28
Time allocation – hours/week					
Study using textbooks, course materials, bibliographies, and notes					30
Additional documentation in the library, on specialized electronic platforms, and in the field					20
Preparation of seminars/labs, assignments, reports, portfolios, and essays					24
Tutoring					5
Examinations					4
Other activities.....					
3.7. Total hours of individual study					83
3.8. Total hours per semester					125
3.9. Number of ECTS					5

4. Preconditions (if the case)

4.1. of curriculum	• General biochemistry knowledge on the main classes of biomolecules: proteins, carbohydrates, lipids and nucleic acids
4.2. of competences	•

5. Conditions (if the case)

5.1. for course	• Lecture hall equipped with computer, video projection system, and internet connection
5.2. for labs	• Laboratory equipped with the materials, equipment, and reagents necessary to carry out experimental work

6. Course objectives - expected learning outcomes achieved by completing and passing the course

Knowledge	1. Graduates define, understand, explain, and apply advanced knowledge of chemistry from specialized literature in practice. 2. Graduates select and use appropriate experimental and theoretical methodologies to investigate complex scientific problems, assessing their impact on the environment and society. 3. Graduates write analysis and scientific reports, presenting the results of their research and experiments, in line with professional ethics and standards.
Skills	1. Graduates apply major concepts in analytical, inorganic, organic, and physical chemistry to chemical practice. 2. Graduates evaluate and analyze experimental techniques to conduct and design experiments, analyze and test (qualitatively and quantitatively) chemical elements and substances; design, coordinate, and conduct chemical experiments. 3. Graduates apply critical thinking, following the structure and principles of scientific writing to develop and present scientific reports.
Responsibility and authonomy	1. Graduates are able to adapt major scientific concepts in the field of chemistry to conduct research, improve or develop new concepts, knowledge, theories, and operational methods, products, and services in order to apply them in specific activities for product and process quality control. 2. Graduates use classical laboratory instruments/techniques and modern equipment independently, design experiments, and interpret and analyze the obtained results accurately. They design learning situations focused on developing experimental techniques and methods specific to chemical laboratories. 3. Graduates prepare and present scientific reports in line with ethical standards for collecting and interpreting results.

7. Table of contents

7.1. COURSE	Mode of operation	Teaching methods	Allocated time (hours)
1. Nucleic acids • Principles of selected technologies used for analysis of the structure, expression and roles of nucleic acids. • Applications of nucleic acid technologies.	On site (week 1)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
2. Proteins • Principles of selected technologies used for analysis of protein biochemistry and functionality. • Applications of protein technologies.	On site (week 3)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
3. Enzymes • Definition, structure, enzyme classes, • Michaelis Menton equation and enzyme kinetics	On site (week 5)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
4. Factors influencing enzyme activity: • concentration of enzyme and concentration of substrate • temperature and pH • activators and inhitors; types of	On site (weeks 7)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2

enzyme inhibitors			
5. Enzymes • Advanced applications of enzymes (pharmaceuticals -drug synthesis, therapeutics, diagnostics; food industry; textiles and detergents, biofuels and environment) • Modern innovations in enzyme science (protein engineering and enzyme immobilization)	On site (week 9)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
6. Introduction to signal transduction • General principles of signaling • Importance of phosphorylation, kinases and phosphatases • Receptors with tyrosine kinase activity • General presentation • PDGF receptors • Therapeutic advances of targeting receptor tyrosine kinases in cancer	On site (weeks 11)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
7. G protein-coupled receptors (GPCR) • General presentation of GPCR receptors and their membrane insertion model • Examples of agonists and antagonists and their therapeutic applications.	On site (week 13)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2

References:

1. Shen, C.-H. (2023). *Diagnostic Molecular Biology* (2nd ed.). Academic Press. ISBN: 9780323917889. https://www.educate.elsevier.com/book/details/9780323917889
2. Bisswanger, H. (2017). *Enzyme Kinetics: Principles and Methods* (2nd ed.). Wiley-VCH. ISBN: 9783527340965, https://onlinelibrary.wiley.com/doi/book/10.1002/9783527806461
3. Reetz, M. T., Sun, Z., & Qu, G. (2023). *Enzyme Engineering: Selective Catalysts for Applications in Biotechnology, Organic Chemistry, and Life Science*. Wiley-VCH. ISBN: 9783527836895. https://onlinelibrary.wiley.com/doi/book/10.1002/9783527836895
4. Krauss, G. (2014). *Biochemistry of signal transduction and regulation* (5th ed.). Wiley-VCH. https://www.wiley.com/en-us/Biochemistry+of+Signal+Transduction+and+Regulation%2C+5th+Edition-p-9783527333660
5. Kramer, I. M. (2016). *Signal transduction* (3rd ed.). Academic Press. https://shop.elsevier.com/books/signal-transduction/kramer/978-0-12-394803-8
6. Lecture notes, 2025

7.2. Lab	Mode of operation	Teaching methods	Allocated time (hours)
1. Safety rules in the laboratory of Biochemistry	On site (week 1)	Explanation, discussion, debate, and questioning	4

2. Protein electrophoresis	On site (week 3)	Experiment, explanation, discussion, debate, and questioning	4
3. Determination of the enzyme and specific activity of alpha-mannosidase	On site (week 5)	Experiment, explanation, discussion, debate, and questioning	4
4. Determination of the alpha-amylase activity of the enzyme preparation Thermamyl using the Bernfeld-Hostettler method	On site (week 7)	Experiment, explanation, discussion, debate, and questioning	4
5. Factors influencing enzyme activity. Influence of pH and of temperature on the enzyme activity of the enzyme preparation Thermamyl	On site (week 9)	Experiment, explanation, discussion, debate, and questioning	4
6. Factors influencing enzyme activity. Inhibitors. Enzyme kinetics. Determination of kinetic parameters Km, Vmax and K_I.	On site (week 11)	Experiment, explanation, discussion, debate, and questioning	4
7. Lab Verification	On site (week 13)	Experiment, explanation, discussion, debate, and questioning	4
References:			
1. Lab work presentations, 2025.			

8. Corrrelation of the discipline content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the course is in line with those of similar courses at universities in Romania and abroad, while also meeting the expectations of professional associations and representative employers in the field.

9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation method	9.3. Contribution to final score
9.4. Course	theoretical concepts and mechanisms, critical analysis of literature	Written Exam	50%
		Portofolio	20%
9.5. Lab	-Practical skills acquired during the semester. -Degree of involvement in the activities of the discipline. -Data interpretation and the method of preparation of the laboratory reports	Continuous evaluation during the semester, verification of laboratory reports	30%
9.6. Minimum performance standard			
• Basic understanding of core concepts • Principles of selected technologies used for analysis of protein biochemistry and functionality. • Elementary understanding of the factors influencing enzyme activity			

• Completion of practical/project tasks

Date 22.09.2025	Course coordinator, Lect. dr. Catalina Ionescu
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Date of approval 25.09.2025	Head of Department, Conf.dr. Nicoleta Cioateră