COURSE GUIDE – EXTENDED FORM

Academic year 2026 – 2027

1. Program information

1.1 University	*"Gheorghe Asachi" Technical University of Iasi*
1.2 Faculty	*"Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection*
1.3 Department	*Organic, Biochemical and Food Engineering*
1.4 Field	*Chemical Engineering*
1.5 Study level	*Master*
1.6 Specialization	*Chemical and Biochemical Process Technology - CBPT*

2. Course information

2.1.1 Course name	**Bioinformatic & Bioanalysis**						
2.1.2 Course code	503	2.1.3. Course category Fundamental/Specialized/Complementary)	DS				
2.2 Course instructor	Lecturer Elena Niculina Dragoi						
2.3 Course instructors for applied activities (S, L, P, Pr)	Lecturer Elena Niculina Dragoi						
2.4 Year of study [2]	1	2.5 Semesterl[3]	1	2.6 Evaluation type[4]	V	2.7 Course type [5]	DOB

3. Amount of time estimated for course activities (hours / term)

3.1 Hours /week	2	3.2 course	1	3.3a sem.	0	3.3b laboratory	0	3.3c project	1	3.3.d. practice	0
3.4 Total hours from curriculum[6]	28	3.5 course	14	3.6a sem.	0	3.6b laboratory	0	3.6c project	14		

Time spent for related activities[7]	Hours
Study of recommended books, course support, scientific papers and course notes	15
Study in library and practical skills development	15
Preparation of seminars / laboratory works / project phases / home works / presentations	17
Evaluation[8]	3
Other activities:	

3.7 Total hours of individual study [9]	47
3.8 Total hours per semestre[10]	75
3.9 Number of credits	3

4. Prerequisites (optional)

4.1 curriculum[11]	-
4.2 learning outcomes	-

5. Requirements

5.1 Conditions for course delivery[12]	The classroom must have a video projector, Internet connection and a whiteboard/blackboard for examples
5.2 Laboratory requirements[13]	The laboratory room must have an Internet connection and a whiteboard/blackboard for examples. The students need computers with a language/software that allows them to solve laboratory assignments (Excel/Matlab recommended).

6. Overall objective of the course

This course covers computational and analytical methods in proteomics and structural bioinformatics, emphasizing practical skills using accessible software tools for protein analysis, structure prediction, and visualization.

7. Learning outcomes

Knowledge	The student / graduate: - understands core concepts of proteomics and structural bioinformatics, including protein structure, function, and the relationship between sequence and structure. - describes experimental and computational methods used in proteomics and structural bioinformatics. - recognizes the main databases and tools and their applications in protein analysis and structure visualization. - explains the strengths and limitations of different analytical and computational approaches in proteomics and structural bioinformatics.
Skills	The student / graduate: - applies bioinformatics tools and free software to analyse proteomics and structural data. - processes and interprets proteomics data: import, clean, and analyze mass spectrometry data; identifies and quantify proteins; performs statistical analysis and visualize results using Excel and MATLAB. - predict and validate protein structures: use sequence alignment, secondary/tertiary structure prediction, homology modelling, and molecular docking tools. -critically evaluates and compares results from different methods, and select appropriate strategies for specific research questions. -communicates findings clearly in written reports and oral presentations, using appropriate scientific language and visualization
Responsibility and autonomy	The student / graduate: - works independently and collaboratively to solve complex problems in proteomics and structural bioinformatics, including project planning and time management. -demonstrates scientific integrity: critically assess data quality, reproducibility, and ethical considerations in bioinformatics research. - takes responsibility for continuous learning: seek out and evaluate new tools, databases, and literature to stay current in the rapidly evolving fields of proteomics and structural bioinformatics. - reflects on the societal and biomedical impact of proteomics and structural bioinformatics, considering applications in health, industry, and research

8. Teaching methods

The teaching process will involve participatory lectures and debates, supported by PowerPoint presentations made available to students. These presentations include images and diagrams to make the information easier to understand and assimilate. Each lecture will begin with a brief review of the topics covered in the previous session.

The teaching method is also based on discovery learning models, facilitated through both direct and indirect exploration of reality (e.g., experiments, demonstrations, modelling). Additionally, action-based methods will be employed, such as practical exercises, hands-on activities, and problem-solving tasks.

9. Course content

9. 1. Courses[15]	**Teaching methods**	**Time allocation**
9.1.1. Introduction to Proteomics. Protein structure and function overview. Protein identification and quantification methods. Protein post-translational modifications. Introduction to proteomic databases	Interactive lecture Guided discussions Clarifying explanations	2 hours
9.1.2. Computational Proteomics. Protein sequence analysis and motif detection. Mass spectrometry data analysis basics. Protein-protein interaction databases and prediction methods. Quantitative proteomics data processing		4 hours
9.1.3. Protein Structure Basics. Levels of protein structure: primary, secondary, tertiary, quaternary. Protein structure databases. Visualization of protein structures		4 hours
9.1.4. Protein Structure Prediction. Secondary structure prediction methods. Homology modelling and threading. Ab initio structure prediction basics. Structure refinement and validation		4 hours
Course bibliography: 1. Jenny Gu (Editor), Philip E. Bourne (Editor), Structural Bioinformatics, 2nd Edition. ISBN: 978-0-470-18105-8. Wiley-Blackwell (2009) 2. Jonathan Pevsner. Bioinformatics and Functional Genomics, 3rd edition. ISBN: 978-1-118-58176-6 (2015)		
9.2c Project	Working methods [17]	Observations, Time allocation

9.2.c. Optimization of Recombinant Protein Production Using Integrated Bioinformatics and Bioanalytical Approaches	Practical demonstrations, exercises, experiments	
9.2.c.1. Phase 1: Target Protein Selection and Analysis		2 hours
9.2.c.2. Phase 2: Bioprocess Design and Modelling		10 hours
9.2.c.3. Final evaluation		2 hours

Bibliography for applied activities (seminar / laboratory / project):

1. "Bioinformatics with MATLAB: Practical Applications in Proteomics and Structural Biology" (various authors, MathWorks documentation). Guides on using MATLAB Bioinformatics Toolbox for sequence analysis, mass spectrometry data processing, and protein structure visualization. https://www.mathworks.com/products/bioinfo.html
2. "PyMOL User's Guide" . Documentation and tutorials for molecular visualization and structural analysis using PyMOL.https://pymol.sourceforge.net/newman/userman.pdf

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation method		10.3 Percentage of the final grade *(recommended to be proportional to the number of hours allocated to each type of activity)*
10.4 Type of evaluation: Final Exam / Assessment	*Completeness and correctness of knowledge. Logical coherence, fluency, strength of argumentation. Capacity for analysis, personal interpretation, originality, creativity. Degree of mastery of specialized terminology and communication skills. Ability to apply acquired skills. Ability to process data and solve given problems.*	*Formative assessment test (ongoing evaluations throughout the semester).*	*50 %*	50%
		Summative assessment test (final evaluation).	*40 %*	
10.5b Project	*Project activity – Ability to work in a team, ability to apply learned knowledge in practice, in different contexts. Capacity for analysis, personal interpretation, originality, and creativity.*	*Completion of project sheets (all project works must be completed)*		50%
10.6 Conditions for passing				
The final evaluation result for a course is determined by considering the scores and weights assigned to each activity within the course. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimal learning outcomes required for the course and the awarding of the corresponding study credits.				

Date: 3.09.2025
Course instructor: Lecturer Elena Niculina Dragoi
Course instructors for applied activities: Lecturer Elena Niculina Dragoi

Date of approval by the department: 5.09.2025

Head of Department
Associate professor Corina Cernatescu

Date of approval by the Faculty Council: 8.09.2025

Dean,

Professor Teodor Malutan

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[1] *Bachelor's / Master's degree.*
[2] *For Bachelor's: 1-4; for Master's: 1-2.*
[3] *For Bachelor's: 1-8; for Master's: 1-4..*
[4] *Exam (E), assessment (A) – according to the curriculum.*
[5] *DOB – mandatory course, DOP– optional course, DFA– elective course;*
[6] *Duration equals 14 weeks multiplied by the number of hours listed at point 3.1 (similarly for points 3.5 and 3.6abc).*
[7] *The lines below refer to individual study; total is completed at point 3.7.*
[8] *Between 2 and 6 teaching hours, not included in individual study..*
[9] *Total number of individual study hours (sum of values from previous lines).*

[10] *Total of direct teaching hours (3.4) plus individual study hours (3.7); must equal the number of credits (3.9) multiplied by 27 hours per credit.*
[11] *Prerequisite courses that must be passed previously or their equivalents are indicated.*
[12] *Teaching resources: blackboard, video projector, flipchart, specific teaching materials, etc.*
[13] *Technical equipment: computers, software packages, experimental stands, etc*
[14] *Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course, aligned with level 7 of the National Qualifications Framework (NQF) and adapted to the type of university program. For research master's programs, these include competences necessary for conducting independent scientific research (https://www.aracis.ro/wp-content/uploads/2025/07/Standarde-specifice-masterat.pdf).*
[15] *Titles of chapters and paragraphs.*
[16] *Teaching methods: discussions, debates, presentations and/or paper analyses, exercises and problem solving.*
[17] *Practical demonstrations, exercises, experiments.*
[18] *Case studies, demonstrations, exercises, error analysis, etc.*