COURSE SYLLABUS

1. Program information

1.1. Institution	Petroleum-Gas University of Ploieşti
1.2. Faculty	Petroleum Refining and Petrochemistry
1.3. Department	Petroleum Processing Engineering and Environmental Protection
1.4. Field of study	Chemical Engineering
1.5. Study cycle	Full time
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

2. Course information

2.1. Course title	Process modeling, simulation and optimization
2.2. Course coordinator	Assistant Prof. PhD. Eng. Fendu Elena Mirela
2.3. Laboratory / seminar / coordinator	Assistant Prof. PhD. Eng. Nicolae Marilena
2.4. Project coordinator	-
2.5. Year of study	1st
2.6. Semester *	2nd
2.7. Evaluation type	Exam
2.8. Course type - formative category **/ Type of subject matter ***	SC/OPT

* The semester number is according to the curriculum.

** FC – Fundamental courses; SC – Specialization courses; CC – Complementary courses.

*** Mandatory/imposed = MND; Optional = OPT; Elective = ELE.

3. Total estimated time (teaching hours per semester)

3.1. Number of hours per week	4	of which: 3.2. course	2	3.3.Seminar/laboratory	2	3.4.Project	
3.5. Total hours from curriculum	56	of which: 3.6. course	28	3.7. Seminar/laboratory	28	3.8. Project	
3.9. Total hours of individual study (Study of textbook, course support, bibliography, study of textbook, course support, further reading in the library, on online platforms, preparing seminars/laboratories, homework, portfolios and essays)							124
3.10. Total hours per semester							180
3.11. Number of credits							6

4. Requirements (where applicable)

4.1. Curriculum requirements	Computer Programming, Chemical Processes
4.2. Course requirements:	Projector, screen, computers
4.3.Seminar/Laboratory requirements:	Computers with AVEVA PRO/II Software process simulation program

5. Specific competences acquired and learning achievements* outcomes

Professional competences	**Learning achievements***
1. Designs equipment and installations for the chemical industry	**K1** - The student describes advanced principles of equipment sizing and operation **K2** - The student identifies modern technological solutions for process intensification. **K3** - The student defines criteria for selecting materials and equipment depending on applications **S1** - The student uses computer-aided design methods. **S2** - The student develops technological schemes and mass and energy balances. **LO1** - The student assumes responsibility for coordinating engineering projects. **LO2** - The student collaborates effectively in multidisciplinary teams.
2. Develops and optimizes complex chemical processes	**K1** - The student describes and correlates advanced models of chemical kinetics and applied thermodynamics. **K2** - The student explains mechanisms of mass, heat, and momentum transfer in complex reactive systems. **K3** - The student defines computational methods for process simulation and optimization. **S1** - The student applies specialized software for process design and analysis. **S2** - The student integrates experimental data with mathematical models for process optimization. **LO1** - The student makes autonomous decisions regarding process efficiency, safety, and sustainability. **LO2** - The student documents and presents results in technical-scientific reports
Transversal competences	**Learning achievements***
1. Develops critical thinking and the ability to solve complex problems	**K1** - The student identifies reasoning models applicable in interdisciplinary contexts. **S1** - The student applies methods of analysis and synthesis to solve complex problems. **S2** - The student uses modern tools for decision evaluation and substantiation. **LO1** - The student takes responsibility for the proposed solutions and their impact. **LO2** - The student demonstrates autonomy in the critical approach of complex situations
2. Demonstrates lifelong learning ability and the use of IT resources	**K1** - The student explains the principles of responsible use of IT resources **S1** - The student uses digital platforms and resources for documentation and learning. **S2** - The student integrates new information in solving professional tasks. **LO1** - The student demonstrates autonomy in selecting and using learning resources.

* K – knowledge; S – skills; LO – responsibility and autonomy.

6. Course objectives (derived from the list of specific competences acquired)

6.1. General objective	Designs, develops and optimizes chemical processes
6.2. Specific objectives	Designs and simulates equipment and installations for the chemical industry. Develops and optimizes complex chemical processes

7. Contents

7.1. Course	Time	Teaching methods	Comments
Modeling and simulation of unit processes	15	Course material made available in the form of slides, books in PDF format - Interactive Teaching using Power Point AVEVA PRO / II Simulator Software - Questions and periodic tests	
Convergence	3		
Simulation of recycling processes	3		
Display the results and their interpretation	2		
Optimization methods	5		
Bibliography 1.Seider. Seader, Lewin, Process Design Principles – John Wiley & Sons, Inc., 1999. 2.Douglas, Conceptual Design of Process Engineering, McGraw Hill, 1988. 3.Bohîlţea, Cursaru, D., Elemente de modelare şi optimizare a proceselor chimice, MatrixRom, 2009. 4.*, AVEVA PRO/II Manuals 2025.			
7.2. Seminar / laboratory	Time	Teaching methods	Comments
Modeling and simulation of simple unit processes	6	- Interactive Teaching using AVEVA PRO/II Simulator Software and office package - Questions and periodic tests	
Modeling and simulation of complex unit processes	9		
Convergence	3		
Simulation of recycling processes	3		
Display the results and their interpretation	2		
Chemical process optimization	5		
Bibliography 1. *, AVEVA PRO/II Manuals 2025. 2. Bohîlţea, Cursaru, D., Elemente de modelare şi optimizare a proceselor chimice, MatrixRom, 2009.			
7.3 Project	Time	Teaching methods	Comments
Bibliography			

8. Correlation of the course contents with the demands of the epistemic community representatives, professional associations, and representative employers in the field of the program

The course syllabus was developed in collaboration with representatives of engineering companies that hire graduates of similar master's programs.

9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Percentage of final grade
9.4. Course	Presence	Presence	10
	Quality and quantity of accumulated knowledge	Practical exam, computer applications	60

9.5. Seminar/laboratory	Quality and quantity of accumulated knowledge	Presence The accuracy of laboratory works The accuracy of homework's	30
9.6. Project			
9.7. Minimum performance standard			
➢ Simulation and optimization of a chemical process.			

Signature/date 22.09.2025	Course coordinator	Laboratory coordinator	Project coordinator

Date of approval in the department 26.09.2025	Head of department Assoc. Prof. PhD Eng. Neagu Mihaela	Dean Assist. Prof. PhD Eng. Duşescu Vasile Cristina