COURSE SYLLABUS

1. Program information

1.1. Institution	Petroleum – Gas University of Ploiești
1.2. Faculty	Petroleum Technology and Petrochemistry
1.3. Department	Petroleum Processing Engineering and Environmental Protection
1.4. Field of study	Chemical Engineering
1.5. Study cycle	Master
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

2. Course information

2.1. Course title	Chemical plant design and economics		
2.2. Course coordinator	Prof. Dragoș Ciuparu		
2.3. Laboratory / seminar coordinator	Prof. Dragoș Ciuparu		
2.4. Project coordinator	Prof. Dragoș Ciuparu		
2.5. Year of study	2		
2.6. Semester *	3		
2.7. Evaluation type	Exam		
2.8. Course type - formative category **	DA	2.9. Type of subject matter ***	C

* the semester number is in accordance with the curriculum;

** fundamental = DF; domain = DD; speciality = DS; complementary = DC; thoroughgoing = DA; synthesis = DSI.

*** compulsory = C; optional = O; elective = E

3. Total estimated time (teaching hours per semester)

3.1. Number of hours per week	7	of which: 3.2. course	3	3.3. Seminars/laboratories	2	3.4. Project	2
3.5. Total hours from curriculum	70	of which: 3.6. course	30	3.7Seminars/laboratories	20	3.8 Project	20

3.9Time distribution	hours
Study of textbook, course support, bibliography and notes	8
Further reading in the library, on online platforms and fieldwork	6
Preparing seminars / laboratories, homework, portfolios and essays	4
Tutoring	
Examinations	2
Other activities	

3.10 Total hours of individual study	20
3.11. Total hours per semester	90
3.12. Number of credits	5

4. Prerequisites (where applicable)

4.1. of curriculum	➢ Chemical reactors ➢ Transfer phenomena
4.2. of skills	➢ General chemical engineering skills; ➢ General computer software skills;

5. Requirements (where applicable)

5.1. of course	➢ Room with projector
5.2. of seminars/laboratory	➢ Room with computers connected to the internet; ➢ Software licenses for process modelling and simulation: Pro II, Aspen Engineering, Unisim Design, etc.

6. Specific competences

Professional competences	➢ Description, analysis and advanced utilization of engineering concepts and fundamental theories in petroleum refining; ➢ Equipment, process and plant design; ➢ Real time control of processes and plants in chemical industry. ➢ Modeling, simulation and design of chemical processes.
Cross-curricular competences	➢ Documentation, information and scientific literature research; ➢ Independent and autonomous achievement of individual professional tasks; ➢ Advanced knowledge of computer, internet and specific chemical engineering software; ➢ Management organization and planning of professional teams and organizations.

7. Course objectives (based on the competence grid)

7.1. General objective	➢ Apply general chemical engineering knowledge to design petroleum refining processes and plants using process modelling and simulation software
7.2. Specific objectives	➢ Learn how to assess the economics of process and plant design; ➢ Learn how to develop and review process flow diagrams; ➢ Learn how to use process modelling and simulation software for plant design; ➢ Learn how to estimate capital expenditure and operational expenditure for a plant.

8. Contents

8.1. Course	Time	Teaching methods	Comments
1. Introduction	1	Multimedia techniques	
2. Process conception and design	8	Multimedia techniques	
3. Use of simulation software for process and plant design	8	Multimedia techniques	
4. Process economics and cost assessment	6	Multimedia techniques	
5. Risk assessment, process safety and environmental impact analysis	4	Multimedia techniques	
6. Optimizing process design	3	Multimedia techniques	
Bibliography a) Books			

Gavin Towler, Ray Sinnott, Chemical Engineering Design Principles, Practice and Economics of Plant and Process Design, Second Edition, Elsevier, 2013 Peters, M.S., Timmerhaus, K.D., Plant Design and Economics for Chemical Engineers, McGraw-Hill, Inc. New York 1991. b) Periodicals Chemical Engineering Petroleum Technology Quarterly Magazine Suite			
8.2. Seminar / laboratory	Time	Teaching methods	Comments
1. Project statement of work and project simulation definition;	4	Hands-on, interactive	
2. Initial estimations, model convergence and recycle simulation;	4	Hands-on, interactive	
3. Economic assessment and cost estimation;	4	Hands-on, interactive	
4. Case study and process optimization;	4	Hands-on, interactive	
5. Process profitability and sensitivity analysis.	4	Hands-on, interactive	
Bibliography ProII Input manual, class notes and Course support books.			
8.3. Project	Time	Teaching methods	Comments
1. Defining project statement of work and assessment of profitability potential;	4	Hands-on, interactive	
2. Development of the process flow diagram;	4	Hands-on, interactive	
3. Process simulation and optimal design;	4	Hands-on, interactive	
4. Economic assessment and cost estimation;	4	Hands-on, interactive	
5. Profitability and sensitivity analysis	4	Hands-on, interactive	
Bibliography Pro II Input manual, class notes and Course support books.			

9. 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 cooperation with representatives of engineering companies in Ploiești and Bucharest that have hired graduates of similar master programs.

10. Evaluation

Activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Percentage of final grade
10.4. Course	The design approach technique	Practical	25%
	Accuracy and precision of technical and economic calculations	Practical	25%
	Correctness of design decisions	Practical	10%
	Complying with ethical	Practical	5%

	principles		
	Quality of presentation of design results	Practical	5%
10.5. Seminar / laboratory	Degree of completion of lab assignments	Practical	5%
10.6. Project	Completion of design project	Practical	25%
10.7. Minimum performance standard			
➢ Students complete their project work with satisfactory results; ➢ Students are capable to elaborate an original design project, employing process simulation software, and performing an order of magnitude estimate of project costs and profitability analysis.			