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	Master
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

2. Course information

2.1. Course title	Risk engineering in petroleum processing industry		
2.2. Course coordinator	Phd.Eng..Lecturer Costin Ilinca		
2.3. Laboratory / seminar coordinator	Phd.Eng..Lecturer Costin Ilinca		
2.4. Project coordinator	-		
2.5. Year of study	1		
2.6. Semester *	2nd		
2.7. Evaluation type	Ex		
2.8. Course type - formative category **	DS	2.8. 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	4	of which: 3.2.course	2	3.3. Seminars/laboratories	2	3.4Project	-
3.5Total hours from curriculum	56	of which: 3.6 course	28	3.7Seminars/laboratories	28	3.8 Project	-

3.9Time distribution	hours
Study of textbook, course support, bibliography and notes	50
Further reading in the library, on online platforms and fieldwork	20
Preparing seminars / laboratories, homework, portfolios and essays	10
Tutoring	
Examinations	10
Other activities	

3.10. Total hours of individual study	34
3.11. Total hours per semester	56
3.12. Number of credits	5

3. Prerequisites (where applicable)

4.1. of curriculum	➢ Mechanical engineering
4.2. of skills	➢

4. Requirements (where applicable)

5.1. of course	Students will not attend lectures, seminars with open mobile phones. Also, telephone conversations will not be tolerated during the course, nor do students leave the classroom to take over personal telephone calls; The students' delay in the course will not be tolerated as it turns out to be disruptive to the educational process; The course will be hosted in a computer room, videoprojector, blackboard and Internet connection.
5.2. of seminars/laboratory	The delay of the students at the laboratory and the seminar will not be tolerated because it is proving to be disruptive to the educational process. The term of the tuition of the papers is determined by the student in agreement with the students. Claims for postponement will not be accepted for reasons other than a legitimate objective. Also, for late submission of the papers, papers will be submitted.

5. Specific competences

Professional competences	PC1. Description, analysis and advanced utilization of engineering concepts and fundamental theories in petroleum refining. PC2. Characterization of physical and chemical structural properties, of petroleum products by complex analytic methods. PC3. Equipment, process and plant design. PC4. Real time control of processes and plants in chemical industry. PC5. Modeling, simulation and design of chemical processes.
Cross-curricular competences	TC1. Documentation, information and scientific literature research. TC2. Independent and autonoms achievement of individual professional tasks. TC3. Advanced knowledge of computer, internet and specific chemical engineering software. TC4. Management organization and planning of professional teams and organizations.

6. Course objectives (based on the competence grid)

7.1. General objective	consists in acquiring knowledge and creating the necessary skills to know the main concepts of the notion of risk and technical security and the interpretation of the results obtained from the technical / technological risk analyzes.
7.2. Specific objectives	consist in acquiring knowledge and building competencies in performing technical / technological risk analyses.

7. Contents

8.1. Course	Time	Teaching methods	Comments

Security and technical risk. Fundamental concepts, notations used, relationships of complementarity.	2	lecture; debate	
Risk Factors Identification and classification, intrinsic factors, extrinsic factors, associated factors, human factor.	2	lecture; debate	
The main mechanical criteria of technical security regarding technology equipment. Generalities, technical security criteria for mechanical resistance, technical safety criteria for prevention of cracking and fracture of the material in operation, technical safety criteria for ensuring mechanical stability.	2	lecture; debate	
Prevention of rupture / destruction through the flute. Larson Miller Parameters Breakthrough analysis chart.	2	lecture; debate	
Oligocyclic burden. The Palmgren-Miner criterion of linear cumulation of damage.	2	lecture; debate	
Risk in petrochemical technological installations. Definition, identification and evaluation. Risk parameters, quantifiable risk.	2	lecture; debate	
Analysis of technical / technological risks according to the normative SR EN 1050-2000. Technical and technological risk analyses at national level.	4	lecture; debate	
Technical risk analysis strategies at European level. FMAE / FMECA type analyses according to MIL-STD 1629. Generalities. Basic principles (procedures) in FMECA type assays.	4	lecture; debate	
Strategies for technical risk analysis. FTA-type analyses. The process of realizing the fault logic tree, defining the analysed system of interest, defining the "TOP" event of the analysis, defining the upper structure of the fault logic tree.	4	lecture; debate	
Analysis of technical technical risks using the MADS-MOSAR method. Presentation and substantiation of Module A and Module B analysis	4	lecture; debate	

Bibliography

1. Borgovini, Robert; Pemberton, S.; Rossi, M. (1993). *Failure Mode, Effects and Criticality Analysis (FMECA)* (pdf). B. Reliability Analysis Center. p. 5. CRTA–FMECA. Retrieved 2010-03-03.
2. *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)* (pdf). International Electrotechnical Commission. IEC 812. Retrieved 2013-08-08.
3. *Larsen, Waldemar (January 1974). Fault Tree Analysis. Picatinny Arsenal. Technical Report 4556. Retrieved 2014-05-17.*
4. *Ericson, Clifton (1999). "Fault Tree Analysis - A History" (PDF). Proceedings of the 17th International Systems Safety Conference. Archived from the original (pdf) on 2011-07-23. Retrieved 2010-01-17.*

5. *PavelA.,TeodorescuM.,Kulin M., Dumitru Gh. – Ţevi. Tubulaturi. Componente tubulare.Coloane tubulare. Expetize tehnice. Studii de caz. Cercetări şi analize. Bucureşti, Editura Ilex, 2003.*
Perilhon P. - MADS-MOSAR. Méthodologie d'Analyse des Dysfonctionnements des Systémes - Méthode Organisée et Systémique d'Analyse de Risques. Description et illustration. Antenne Enseignement de Grenoble, Institut National des Sciences et Techniques Nucléaires, 1995.

8.2. Seminar / laboratory	Time	Teaching methods	Comments
Probabilistic substantiation of safety coefficients. Creating specific interactive graphical interfaces in the MATLAB programming environment.	4	Case studies; Debate	
The numerical approach of the Larson-Miller parametric method. Creating specific interactive graphical interfaces in the MATLAB programming environment.	6	Case studies; Debate	
Using and drawing breakout charts. Creating specific interactive graphical interfaces in the MATLAB programming environment.	4	Case studies; Debate	
Using the FTA method in analysis in quantification of ethnic risk in oil and petrochemical plants. Case studies.	4	Case studies; Debate	
The use of the FMEA / FMECA method in the analysis of quantification of ethnic risk in petroleum and petrochemical installations. Case studies through the specialized program Xfmea.	6	Case studies; Debate	
The use of the MADS-MOSAR method in analysis in the quantification of ethnic risk in oil and petrochemical plants. Case studies.	4	Case studies; Debate	

Bibliography

1. Borgovini, Robert; Pemberton, S.; Rossi, M. (1993). *Failure Mode, Effects and Criticality Analysis (FMECA)* (pdf). B. Reliability Analysis Center. p. 5. CRTA–FMECA. Retrieved 2010-03-03.
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5. *PavelA.,TeodorescuM.,Kulin M., Dumitru Gh. – Ţevi. Tubulaturi. Componente tubulare.Coloane tubulare. Expetize tehnice. Studii de caz. Cercetări şi analize. Bucureşti, Editura Ilex, 2003.*
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8.3. Project	Time	Teaching methods	Comments
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Bibliography

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 evaluation considers the following categories knowledge: - theoretical assessed by questions related to topics presented in the course - theoretical and Applied Assessed by Final Examination	Written paper	70%
10.5. Seminar / laboratory	General and detailed knowledge assessed by questions about the subject and the working conditions of the laboratory work	Laboratory Activity Assessment; drawing up the papers and interpreting the results of the experimental parts	30%
10.6 Project	-	-	-
10.7. Minimum performance standard			
¬ For note 5 it is necessary to obtain a minimum score of 50% for the theoretical knowledge, as well as to prove a minimum level of understanding and solving the applications in the exam subject (minimum 50%). ¬ For 10 it is necessary to obtain a maximum score for theoretical knowledge and complete and correct solving of the exam subjects (minimum 95%). Laboratory activity: ¬ Note 5 requires a minimum level of 50% for general knowledge as well as a minimum level of understanding and use of laboratory-specific knowledge. ¬ For Note 10 it is necessary to prove a minimum level of 90% for the specific knowledge of the laboratory			