COURSE SYLLABUS

1. Program information

1.1. Institution	Petroleum - Gas University of Ploiesti
1.2. Faculty	Petroleum Refining and Petrochemistry
1.3. Department	Petroleum Refining and Environment Protection Engineering
1.4. Field of study	Chemical Engineering
1.5. Study cycle	Master Degree
1.6. Study program	Chemical Engineering for Refineries and Petrochemistry

2. Course information

2.1. Course title	Raw materials and products in the petroleum refining industry
2.2. Course coordinator	Assistant Professor PhD. Cristina Dusescu - Vasile
2.3. Laboratory / seminar / coordinator	Assistant Professor PhD. Cristina Dusescu - Vasile
2.4. Project coordinator	-
2.5. Year of study	I
2.6. Semester *	1
2.7. Evaluation type	Exam
2.8. Course type - formative category **/ Type of subject matter ***	FC/MND

* 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)							154
3.10. Total hours per semester							210
3.11. Number of credits							7

4. Requirements (where applicable)

4.1. Curriculum requirements	➢ Knowledge of Physical-Chemistry of Petroleum, Thermal – Catalytic Processes, Petrochemistry
4.2. Course requirements:	➢ Classroom equipped with video projector and screen
4.3.Seminar/Laboratory requirements:	➢ Laboratory equipped with specific devices for laboratory work

5. Specific competences acquired and learning achievements* outcomes

Professional competences	**Learning achievements***
1. Develops and optimizes complex chemical processes	K1 - The student describes and correlates advanced models of chemical kinetics S1 - 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.
2. Integrates principles of sustainable development and circular economy	K1 - The student describes advanced concepts of sustainable development applicable in chemical engineering. K2 - The student identifies strategies for reducing, reusing, and valorizing resources. K3 - The student defines performance indicators for sustainable processes. S1 - The student evaluates the environmental impact of chemical processes. S2 - The student proposes technological solutions for pollution reduction and energy efficiency. LO1 - The student makes decisions in accordance with environmental legislation and sustainability principles. LO2 - The student promotes ethical conduct in resource use.
3.Uses advanced techniques of analysis and quality control	K1- The student describes modern methods of instrumental analysis and material characterization. K2 - The student explains principles of validation and calibration of analytical methods. K3 - The student defines quality standards and applicable regulations. S1 - The student applies advanced experimental methods for product characterization. S2 - The student uses statistical tools for analytical data interpretation. LO1 - The student takes responsibility for validating and reporting results. LO2 - The student prepares quality reports according to international standards.
4. Carries out research and innovation activities in chemical engineering	K1 - The student describes advanced research methodologies in chemical engineering. K2 - The student identifies innovative directions for the development of processes and products. K3 - The student defines methods for experiment S1 - The student applies experimental and computational methods to obtain original results. S2 - The student writes scientific papers and research projects. LO1 - The student demonstrates autonomy in carrying out research projects. LO2 - The student disseminates results nationally and internationally.
5. Leads and manages activities in the chemical industry	K1 - The student explains modern methods of process and project management. K2 - The student describes the legal framework and occupational health and safety standards. K3 - The student identifies mechanisms for project economic evaluation. S1 - The student applies management tools for coordinating resources and teams. S2 - The student uses economic and financial analysis methods for processes. LO1 - The student makes strategic decisions regarding project development and implementation. LO2 - The student demonstrates autonomy and leadership in coordinating multidisciplinary teams.
Transversal competences	**Learning achievements***
Develops critical thinking and	K1 - The student identifies reasoning models applicable in interdisciplinary

the ability to solve complex problems	contexts. S1 - The student applies methods of analysis and synthesis to solve complex problems. SA2 - The student uses modern tools for decision evaluation and substantiation. LO 1 - The student takes responsibility for the proposed solutions and their impact. LO 2 - The student demonstrates autonomy in the critical approach of complex situations.
Communicates effectively orally and in writing in Romanian and in an international language	K1 - The student explains the specialized terminology in Romanian and in a foreign language. S1 - The student drafts reports, presentations, and professional documents. S2 - The student delivers oral presentations and debates in academic and professional contexts. LO 1 - The student takes responsibility for the correct and clear transmission of information. LO 2 - The student demonstrates autonomy in selecting means and communication strategies.
Collaborates effectively in multidisciplinary and intercultural teams	K1 - The student explains the dynamics and roles of members in a multidisciplinary team. S1 - The student actively participates in team activities and contributes to achieving common goals. S2 - The student uses collaboration and communication management tools. LO 1 - The student assumes responsibility for their role in the team and respects cultural diversity. LO 2 - The student demonstrates autonomy and initiative in conflict resolution and collaboration facilitation.
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. LO 2 - The student demonstrates autonomy in selecting and using learning resources.
Displays social responsibility, professional ethics, and civic spirit	K1 - The student describes the principles of professional ethics and social responsibility. K2 - The student explains the ethical implications of professional decisions. S1 - The student applies ethical principles in professional and academic activities. LO 1 - The student takes responsibility for the ethical consequences of decisions. LO 2 - The student demonstrates autonomy in promoting ethical and civic conduct.
Manages projects and resources in a complex socio-economic context	K1 - The student explains methods of project planning and evaluation. S1 - The student applies project management tools and techniques. S2 - The student develops plans and reports for the efficient use of resources. LO 1 - The student takes responsibility for decisions regarding project implementation. LO2 - The student demonstrates autonomy and leadership in managing resources and teams.

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

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

6.1. General objective	➢ Knowledge of the main properties of the fossil and unconventional raw materials used in the refining industry, as well as the products obtained from them. The analytical methods involved in raw materials and products characterization; the

	usefulness of these products. Correlation of the quality of raw materials and products with the standards in force. Capacity of synthesis and correlation of experimental results, presenting ability and reasoning of the findings; Laboratory skills: operation of the apparatus, calculation methods specific to the discipline; Discipline, rigor, seriousness. ➢ Students acquire knowledge of chemical composition, molecular structure, physic and chemical properties, methods of analysis, fields of use, aspects of environmental protection. It also aims the students to assimilate the necessary skills to perform the analyses of different raw materials and petroleum products, the processing and critical interpretation of the obtained analytical data, the correlation of the experimental data obtained with the directions of use of the various raw materials and products.
6.2. Specific objectives	After completing the discipline students will be able to: ➢ Characterize conventional and unconventional raw materials or petroleum products from the point of view of their physical characteristics and chemical composition. ➢ Highlight the influence of chemical composition on the useful characteristics of petroleum products and will make correlations between the two aspects. ➢ Choose the optimal oil processing scheme, depending on their chemical composition and physical properties; ➢ Correctly expose the correlation of chemical composition - price - useful features.

7. Contents

7.1. Course	Time	Teaching methods	Comments
Native materials: Conventional crude oils, unconventional crude oils: Crude oil with high acidity, heavy and extra heavy crude oils, foamy crude oil, combustion crude oil, bitumen, condensate, natural gas, refinery gas, bituminous sand, bituminous rocks - properties and compositions	2	The course is presented to students in a conventional way, by systematically exposing information in oral lectures and in course notes offered to students. If the subject of the course permits, along with explanations given to students, conversations between students and the teacher are initiated, so students can identify themselves on the basis of the accumulated knowledge (in the course of Oil Physics and Chemistry, as well as in the previous disciplines required)	
Manufactured material: Wax, resins, asphalt, tar, pitch, cocs, sinthetic crude oil - properties and compositions	2		
Derived materials: asphaltenes, carbenes, carboids, resins and oil - properties and compositions	3		
Oil prices: pricing strategies, type of oil, oil price history, future of oil	4		
Petroleum products and test methods:	10		

crude assay, LPG, automotive fuels, aviation fuels, kerosene, furnace fuels, lubricating oil and grease.		correlations between the chemical structure and the properties of petroleum products. The conversation stimulates critical thinking and divergence, the ability to analyse, synthesize and interpret data. In order to fix the knowledge, from time to time students receive 1-2 questions related to the subjects of the previous course, to which they have to answer in writing in 5-10 minutes. Subsequently, the answers are being discussed, with the deepening of the critical points.	
Miscellaneous products: solvents, sulphur, carbon black feed stock , wax	3		
Elements of standardization, assurance, auditing and certification of the quality of petroleum products	4		

Bibliography

1. Onutu I., Juganaru T., Merceologia produselor petroliere, Ed. U.P.G. Ploiesti, 2018
2. Speight, J.G., The Chemistry and Technology of Petroleum, 3rd Edition. Marcel Dekker, New York. 1999
3. Wauquier, J.P., Petrol brut. Produits petroliers. Schemas de fabrication, Ed. Technip, Paris, 1994.
4. Riazi, M.R., "characterization and Properties of Petroleum Fractions, American Society for Testing and Materials, 2005
5. James G. Speigh, Handbook of Petroleum Product Analysis, John Wiley & Sons,2002
6. Uttam Ray Chaudhuri, Fundamentals of Petroleum and Petrochemical Engineering, CRC Press, Taylor & Francis Group, 2010
7. Totten, G. E., Fuels and Lubricants Handbook, ASTM International, 2003

7.2. Seminar / laboratory	Time	Teaching methods	Comments
Chemical analysis and physical characterization of a condensate	2	Colloquial system in which students participate in the choice of the analysis methods and proper conduct the experimental procedures; on-going discussions launched upon results.	
Characterization of an aviation fuel	2		
Formulation of consistent grease	2		
Determination of rheological properties of consistent grease	2		
Chemical analysis of an atmospheric distillation petroleum residue	4		
Determination of the wax content of petroleum products	2		
Determination of rheological properties of bitumen	4		

Qualitative determination of mineral acidity and alkalinity of bitumen. Determination of the content of soluble substances from bitumen	2		
Presentation of papers	8	Oral lecture and discussion. Plagiarism, copying, use of internet advertising materials, etc. are not accepted. Each theme or work submitted for evaluation must be personal	
Bibliography 1. Wauquier, J.P., Petrol brut. Produits petroliers. Schemas de fabrication, Ed. Technip, Paris, 1994 2. Riazi, M.R., "Characterization and Properties of Petroleum Fractions", American Society for Testing and Materials, 2005 3. Speight, J.G., Handbook of Petroleum Analysis. John Wiley & Sons, New York, 2002. 4. Totten, G. E., Fuels and Lubricants Handbook, ASTM International, 2003			
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 cooperation with representatives of engineering companies in Ploiești and Bucharest that have hired graduates of similar master programs

9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Percentage of final grade
9.4. Course	The evaluation considers the following categories knowledge: -theoretical knowledge evaluated by questions on topics presented in the course	Written examination. In order to take into account the score obtained at the presentation of the paper, the student must obtain at least half of the grade announced in the written test.	50%
9.5. Seminar/laboratory	General knowledge of analysed petroleum products, assessed by questions related to the subject of the laboratory work	Assessment of laboratory activity; Active participation in laboratory activities; Drawing up the reports and interpreting the results of the experimental part	10%
	Advanced knowledge of the methods of analysis	The evaluation of the laboratory reports, questions	10%

	used and the framing of the oil products analysed in the quality standards.	about the obtained results.	
	Presenting a paper on the topic of the course with a theme chosen by the student; the ability to process the collected information, the analysis and the synthesis thereof.	Oral presentation; presentation of documents, discussions and analyses on case studies presented. Plagiarism, copying, use of materials from the Internet unmentioned in paper, etc. are not accepted.	30%
9.6. Project			
9.7. Minimum performance standard			
➢ Minimum knowledge of the main characteristics of the raw materials used in the oil refining industry, respectively of the products obtained. ➢ Minimum knowledge of the chemical composition data of the raw materials used in the oil refining industry, respectively, of the products obtained. ➢ Minimal knowledge of quality standards and induced implications. ➢ Students have to address every issue in the exam subject. ➢ To receive the note on the report, the student will have to present it at the seminar. ➢ Access to the exam in the first session is conditioned by attending at least 75% of the total course hours and performing all laboratory work			

Signature/date	Course coordinator	Laboratory coordinator	Project coordinator
22.09.2025	Assistant Professor PhD. Cristina Dusescu – Vasile	Assistant Professor PhD. Cristina Dusescu – Vasile	

Date of approval in the department	Head of department	Dean
26.09.2025	Associate Professor PhD. Mihaela Neagu	Assistant Professor PhD. Cristina Dusescu – Vasile