

# 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 and Environmental Protection Engineering
1.4. Field of study	Chemical Engineering
1.5. Study cycle	License
1.6. Study program	Chemical Engineering for Refineries and Petrochemical Industry

## 2. Course information

2.1. Course title	Lubricants and additives
2.2. Course coordinator	Assoc.Prof.Liana Bogatu
2.3. Laboratory / seminar / coordinator	Assoc.Prof.Liana Bogatu
2.4. Project coordinator	-
2.5. Year of study	I
2.6. Semester *	I
2.7. Evaluation type	Exam
2.8. Course type - formative category **/ Type of subject matter ***	SC / 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	5	of which: 3.2. course	2	3.3.Seminar/laboratory	3	3.4.Project	0
3.5. Total hours from curriculum	70	of which: 3.6. course	28	3.7. Seminar/laboratory	42	3.8. Project	0
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)							110
3.10. Total hours per semester							180
3.11. Number of credits							6

## 4. Requirements (where applicable)

4.1. Curriculum requirements	<ul style="list-style-type: none"> <li>➤ Science of Materials</li> <li>➤ Lube oils Manufacturing Technology</li> <li>➤ Petroleum Distillation Technology</li> <li>➤ Thermo-catalytic Processes in Petroleum Industry</li> </ul>
4.2. Course requirements:	<ul style="list-style-type: none"> <li>➤ Standard classroom.</li> <li>➤ Video projector and screen.</li> </ul>
4.3.Seminar/Laboratory requirements:	<ul style="list-style-type: none"> <li>➤ Laboratory equipped with modern instruments and</li> </ul>

	<p>equipment for analysis of base oils and lubricating oils.</p> <ul style="list-style-type: none"> <li>➤ Base oils, additives</li> <li>➤ Test Methods Standards</li> </ul>
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## 5. Specific competences acquired and learning achievements\* outcomes

Professional competences	Learning achievements*
1. Uses advanced analysis and quality control techniques	<p><b>K1</b> - The student describes modern methods of instrumental analysis and materials characterization.</p> <p><b>K2</b> - The student explains the principles of validation and calibration of analytical methods</p> <p><b>K3</b> - The student defines quality standards and applicable regulations.</p> <p><b>S1</b> - The student applies advanced experimental methods to characterize products.</p> <p><b>S2</b> - The student uses statistical tools to evaluate analytical data.</p> <p><b>L01</b> - The student assumes responsibility for validating and reporting the results.</p> <p><b>L02</b> - The student develops quality reports according to international standards.</p>
2. Conducts research and innovation activities in chemical engineering	<p><b>K1</b> - The student describes advanced research methodologies in the field of chemical engineering.</p> <p><b>K2</b> - The student identifies innovative directions for the development of processes and products.</p> <p><b>K3</b> - The student defines methods for designing and interpreting experiments</p> <p><b>S1</b> - The student applies experimental and computational methods to obtain original results.</p> <p><b>S2</b> - The student writes scientific articles and research projects.</p> <p><b>L01</b> - The student demonstrates autonomy in carrying out research projects.</p> <p><b>L02</b> - The student disseminates the results nationally and internationally</p>
Transversal competences	Learning achievements*
1. Develops critical thinking and the ability to solve complex problems	<p><b>K1</b> - The student describes methods and techniques for critical analysis and problem solving.</p> <p><b>K2</b> - Studentul identifică modele de raționament aplicabile în contexte interdisciplinare.</p> <p><b>S1</b> - The student applies methods of analysis and synthesis to solve complex problems</p> <p><b>S2</b> - The student uses modern tools to evaluate and substantiate decisions</p> <p><b>L01</b> - The student assumes responsibility for the proposed solutions and their impact</p> <p><b>L02</b> - The student demonstrates autonomy in critically approaching complex situations.</p>
2. Communicates effectively orally and in writing in Romanian and in a foreign language of international circulation	<p><b>K1</b> - The student describes the principles of academic and professional communication.</p> <p><b>K2</b> - The student explains specialized terminology in Romanian and a foreign language.</p> <p><b>S1</b> - The student writes reports, presentations, and professional documents.</p> <p><b>S2</b> - The student gives oral presentations and debates in academic and professional contexts.</p> <p><b>L01</b> - The student assumes responsibility for the correct and clear transmission</p>

	of information. <b>L02</b> - The student demonstrates autonomy in selecting communication means and strategies.
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\* K – knowledge; S – skills; LO – responsibility and autonomy.

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

6.1. General objective	<ul style="list-style-type: none"> <li>➤ The general objective of the discipline is the study of liquid and solid lubricants used in various fields, in concrete applications and specific requirements. In the course are presented general notions of tribology, main characteristics of lubricants, grouped on certain criteria, types of basic oils and main classes of additives, modern requirements and current trends in the manufacture of lubricants.</li> <li>➤ An important part of the course is dedicated to presenting the main categories of liquid and greasy lubricants, as well as their specific applications.</li> </ul>
6.2. Specific objectives	<p>After passing the discipline, students will be able to:</p> <ul style="list-style-type: none"> <li>➤ analyze and evaluate the physico-chemical characteristics of lubricants;</li> <li>➤ develop methods to improve the physico-chemical characteristics of lubricants by adding of the appropriate types of additives;</li> <li>➤ evaluate different type of lubricants, classify them and determine their areas of use.</li> </ul>

## 7. Contents

7.1. Course	Time	Teaching methods	Comments
1. Basic of tribology	4 hours	Interactive and student-centered	
2. Physical and chemical properties of lubricants. The correlation between the applications, specific functions and characteristics of lubricants.	6 hours	Interactive and student-centered	
3. Base oils and additives: representative types, specific chemical structure, correlation between structure and properties.	6 hours	Interactive and student-centered	
4. Types of representative liquid lubricants. Classification, quality standards, formulation and evaluation of the lubricants.	8 hours	Interactive and student-centered	
5. Types of representative of semi-liquid and solid lubricants and specific applications.	2 hours	Interactive and student-centered	
6. Biolubricants. Lubricants obtained from regenerated oils	2 hours	Interactive and student-centered	
Bibliography			
1. Papers documenting the topic of the course, published in specialized journals between 2010 and 2020			
2. Mang Th., Dresel, W., Lubricants and Lubrication, ISBN 978-3-32670-9, publishing house WILEY-VCH,			

2017.

3. Tănăsescu, C., Lubricants Manufacture Technology, Petrol-Gas University publishing house, 2002.

4. Florea, F., Tribology, Universal Cartfil publishing house, Ploiești, 2000.

5. Pavelescu, D., Mușat, M., Tudor, A., Tribology, Didactic and pedagogical publishing house, București, 1977.

6. Popa, St., Dobrescu, C., Petrof, M., Florea, F., Popescu, A., Andronie, Gh., Mineral lubricants for industrial processes, Technical publishing house, București, 1978.

7. Denis, J., Briant, J., Hipeux, J.C., Physico-chimie des lubrifiants, Analyses et Essais, Technip publishing house, Paris, 1997.

8. \*\*\* Afton Chemical, Specification handbook 2012.

7.2. Seminar / laboratory	Time	Teaching methods	Comments
1. Testing and evaluating the physico-chemical characteristics of base oils	12 hours	Interactive and student-centered	
2. Testing and evaluation of the rheological, oxidation resistance and anti-corrosive properties of lubricants.	10 hours	Interactive and student-centered	
3. Testing and assessing the anti-wear and extreme pressure characteristics of lubricants	8 hours	Interactive and student-centered	
4. Characterization of consistent greases	6 hours	Interactive and student-centered	
5. Assessment of lubricant compliance	6 hours	Interactive and student-centered	

#### Bibliography

1. Annual Book of ASTM Standards, Section 5: Petroleum Products, Lubricants, and Fossil Fuels ISBN 978-1-6822-1440-4, 2018.

2. Tănăsescu, C., Cursaru, D., Jugănar, T., Bogatu, L., Lubricants technology- guide for laboratory and numerical applications, Petrol-Gas University publishing house, 2010.

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	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Percentage of final grade
10.1. Course	Acquiring basic knowledge about lubricants and additives	Written paper	70%

	Acquiring specific knowledge of each topic and preparing reports	Written paper	30%
10.2. Seminar / laboratory	Acquiring of knowledge on the characterization of lubricants. Solving specific numerical applications	Evaluation of numerical applications, reports and processing of experimental results	100%
10.3. Project		-	-
10.4. Minimum performance standard			
<ul style="list-style-type: none"> <li>➤ All the topics of the exam should be accomplished for reaching at least 5 score.</li> <li>➤ Laboratory work carried out in full.</li> <li>➤ The final grade is composed of the score achieved for the acquisition of general knowledge (minimum 5 points), the score achieved for the presentation of projects based on topics studied during the semester, and one ex officio point.</li> </ul>			

Signature/date  
22.09.2025

Course coordinator  
Assoc.Prof.Liana Bogatu

Laboratory coordinator  
Assoc.Prof.Liana Bogatu

Project coordinator

Date of approval in the  
department  
26.09.2025

Head of department  
Associate Professor PhD.  
Mihaela Neagu

Dean  
Assistant Professor PhD. Cristina Dutescu  
– Vasile