Course Title	Industrial Processes				
Course Code	OG403				
Course Type	Compulsory				
Level	BSc Level				
Year / Semester	4th year / 7th semester				
Teacher's Name	Dr.-Ing. Paris A. Fokaides				
ECTS	6	Lectures / week	2	Laboratories/week	1
Course Purpose	Industrial processes course provides a thorough and balanced introduction to refinery engineering topics from basic concepts and unit operations to overall refinery units. Based on the fundamentals of thermodynamics and kinetics, the course develops the scientific background needed for an understanding of refinery operations. It also provides an in-depth description of major refinery processes and then assimilates an integrated refinery by focusing on the operational aspects necessary for enhancing performance.				
Learning Outcomes	1. Elaborate the principles of mass, energy and momentum conservation 2. Design a heat-exchanger for oil and gas processing 3. Analyze the performance of a heat exchanger with the use of the log-mean temperature difference method and with the use of the effectiveness NTU method 4. Select a heat exchanger for oil and gas applications 5. Outline the refining processes 6. Describe the composition of crude oils 7. Explain the chemical catalytic and the thermal chemical conversion processes of crude oil 8. Calculate the pseudo-components of petroleum fractions 9. Define the thermophysical properties of petroleum fractions 10. Describe the process of crude distillation 11. Analyze the operation of crude oil desalting, and vacuum destilation				
Prerequisites	ME 200 Thermodynamics I ME 202 Fluid Mechanics I ME 304 Heat Transfer	Corequisites			
Course Content	**1. Heat Exchangers** - Types of heat exchangers - The overall heat transfer coefficient - Analysis of heat exchangers - The log-mean temperature difference method - The effectiveness-NTU method				

	- Selection of heat exchanger for oil and gas applications **2. Refining processes** - Physical separation processes - Chemical catalytic conversion processes - Thermal chemical conversion processes - Refinery configuration **3. Refinery Feedstocks and Products** - Composition of crude oils - Products composition - Physical property characterization data - Chemical analysis data **4. Thermophysical Properties of Petroleum Fractions** - Basic input data - Pseudo-components - Thermophysical properties calculation - Calculation of enthalpy of petroleum fractions **5. Crude Distillation** - Process description - Operation of crude distillation units - Crude oil desalting - Vacuum distillation - Crude distillation material balance **6. Laboratory Exercises** - Aspen Tutorials 01: Heat Exchangers - Aspen Tutorials 02: Heat Exchangers (2) - Aspen Tutorials 03: Simulation of physical separation processes (spliter) - Aspen Tutorials 04: Simulation of a distillation column - e-Sankey Charts: Mass and Energy Balances of selected refinery processes (1) - e-Sankey Charts: Mass and Energy Balances of selected refinery processes (2)
Teaching Methodology	The teaching methodology of this course will be based on lecturing, demonstrating and collaborating. - Lecture notes, comprising of the fundamentals of each module of the course will be prepared and presented in class on a weekly basis. The notes will introduce the major concepts and will focus on specific learning outcomes of the course. - Demonstration activities including the solution of worked examples in class on a weekly basis, as well as laboratorial work will also be employed. For each fundamental concept, at least one worked example will be solved during lectures. The laboratory work will cover all major topics of the course, allowing the students to personally relate to the presented knowledge. - Collaborating teaching through classroom discussion and debriefing will also be encouraged during lectures.

	Besides from the notes taken by students in class, all of the course material will be made available through the class website and also through the eLearning platform. The instructor will also be available to students during office hours or by appointment in order to provide any necessary tutoring.
Bibliography	Textbooks: Cengel, Y. A., Cimbala, J.M., Turner, R.H. (2006). Fundamentals of thermal science. McGraw Hill Education. Fahim, M.A., Al-Sahhaf, T.A., Elkilani, A.S. (2010), Fundamentals of Petroleum Refining. Elsevier. Finlayson, B. A. (2012). Introduction to chemical engineering computing. John Wiley & Sons.
Assessment	Students will be assessed through: - An assignment related to the laboratory exercises - A midterm test at the 7th week of the course, examining the design of heat exchangers and the introduction to refinery processes - A final test at the end of the semester, in which all material will be examined. The weights of the course assessment are as follows: Assignment: 20% Midterm Exams: 20% Final Exams: 60%
Language	English