Course unit title:	Mass and Energy Balance		
Course unit code:	OG 300		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	3		
Semester when the unit is delivered:	5 (Fall)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Paris Fokaides		
Learning outcomes of the course unit:	1. Thermophyscial properties of pure substances and mixtures 2. Mass balances for non-reacting and reacting flows 3. Energy balances in non-reacting systems 4. Computational Applications		
Mode of delivery:	Face-to-face		
Prerequisites:		Co-requisites:	None
Recommended optional program components:	None		
Course contents:	**Module 1: Thermophysical and related properties of materials** ▪ Density, composition and concentration ▪ The Gibbs phase rule ▪ Vapour-liquid equilibrium ▪ Properties of solutions **Module 2: Fundamentals of material balances in non-reacting systems** ▪ The general balance equation ▪ Material balances on non-reacting systems ▪ Degree-of-freedom analysis ▪ Continuous-mixing devices **Module 3: Reactive Material Balances** ▪ Writing and balancing chemical equations ▪ Progress of a reaction ▪ The general material balance procedure for a reactive system ▪ Combustion material balances **Module 4: Energy Balances in non-reacting systems** ▪ First law of thermodynamics for open systems ▪ Thermodynamic databases for pure substances ▪ Combined material and heat balances ▪ Multiple-device system balances **Module 5: Mass and Energy Balance Laboratory Exercises** ▪ Laboratory Exercise 1: Sankey Diagrams using e-Sankey software –Energy mix analysis ▪ Laboratory Exercise 2: Sankey Diagrams using e-Sankey software – Nonreacting system mass balance ▪ Laboratory Exercise 3: Aspen Plus – Real gas properties ▪ Laboratory Exercise 4: Aspen Plus – Mixers and splitters		
Recommended and/or required reading:	Morris, A. E., Fine, H. A., & Geiger, G. (2011). Handbook on Material and Energy Balance Calculations in Material Processing, Includes CD-ROM. John Wiley & Sons		
Textbooks:	▪ D.M.Himmelblau and J.B. Riggs, "Basic Principles and Calculations in Chemical Engineering" Prentice Hall, 8th Edition		
References:	▪ Felder R.M. and Rausseau R.W., “Elementary Chemical Processes”, J.Wiley (1978) ▪ Thompson E.V. and Ceckler W.H., “Intro to Chemical Engineering”, McGraw Hill (1977) ▪ Hougen O.A., Watson K.M. and Ragatz R.A., “Chemical Process Principles, Part I., Material and Energy Balances”, J.Willey (1954)		

Planned learning activities and teaching methods:	The taught part of course is delivered to the students by means of lectures, conducted with the help of computer presentations. Lecture notes and presentations are available through the web for students to use in combination with the textbooks. Lectures are supplemented with laboratory sessions with aim to get acquainted with lab equipment and instruments for measuring temperatures, specific heat capacities, thermal conductivities and other thermal properties.
Assessment methods and criteria:	• Tests: 40% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No