Name	*Distillation*
ECTS credits	*4*
Year / Semester	*II /1°*
Specific learning outcomes	*On successful completion of this module students should be able to:* *1 – Calculate the boiling point of a binary mixture using the isobaric temperature-composition diagram T-x-y and the analytical method using a numerical method* *2 – Determine the number of theoretical stages by the method of Mac Cabe andThiele* *3 – Determine the number of theoretical stages by the method of Poncho et Savarit using the enthalpy data (the isobaric enthalpy-composition diagram H-h-x-y)* *4 – Determine the stage and reflux requirements for multicomponent distillations* *5 – Know how to determine light and heavy keys* *6 – the design of a distillation column* *7 – Participate in class discussions with colleagues and with teachers*
Contents	*The liquid-vapor equilibrium of binary mixtures; phase diagram; vapor Pressure and saturation vapor pressure; equation of Clausius-clapeyron; binary mixtures; Ideal mixtures; the laws of Raoult and Dalton; relative volatility and equilibrium isobaric diagram; real mixtures; activity coefficients; azeotropic point; Continuous rectification of binary mixtures; Description of the operation of the distillation column; condenser and reboiler; Calculation of the number of theoretical stages by the method of Mac Cabe and Thiele; Lewis's hypotheses; graphic construction of theoretical plates; minimum number of theoretical stages N_m; minimum reflux r_m; calculation of the number of stage by the method of Lewis and Sorel; calculation of the number of theoretical stages by the method of Ponchon and Savarit; multicomponent distillation calculation; Underwood's method; Gilliland correlation.*
Teaching and learning methods	*Face to face, 60 hours*
Teaching techniques	*Lectures, 35 hours* *Practical classes, 25 hours*
Assessment methods	*Written and oral.* *A mid-term written test and a final-term written test are foreseen.* *The mid-term written test will be devoted to the assessment of the level of achievement of LOs 2 and 3.* *The final term written test will be devoted to the assessment of the level of achievement of LOs 2, 3 and, mainly, 4 and 5.* *The oral test will be devoted to the assessment of the level of achievement of LOs 1, 2, 6 and 7 (theoretical comprehension of the subject and the capacity to understand and to express the related concepts).*
Assessment criteria	*In the mid-term test students should determine the boiling point of a binary mixture using the isobaric temperature-composition diagram T-x-y and the analytical method using a numerical method, calculate the quantities of constituents in the liquid and vapor phases in equilibrium, calculate saturation vapor pressures of the constituents and draw the equilibrium curve y=f(x) for constant pressure using the laws of Raoult and Dalton.* *In the final term test students will be required to determine the number of theoretical stages using a graphical method (Mac Cabe and Thiele, Ponchon and Savarit), an analytical method (Lewis and Sorel) for the case of binary mixtures, and Underwood's method; Gilliland correlation Lewis and Matheson for multicomponent distillation.* *Finally, students' ability to participate in class discussions with teachers and colleagues will be assessed in practical classes.*
Assessment metrics	*Attribution of a final grade*

Criteria of attribution of the final grade	*The grade goes from 1 (minimum) up to 20 (maximum). The minimum threshold to pass is 7. To pass the exam students should obtain the minimum evaluation in all the assessments.* *The final grade will be determined according to the following rules:* - *Mid-term written test: 30%* - *Final term written test: 50%* - *practical work: 20%*
Preparatory course units	*N.A.*
Didactic material	*- J. M. Coulson, J. F. Richardson : Chemical Engineering Design, volume 6, Second edition 1993.* *- B. Grandjean, Distillation & Extraction, Volume 1 :Notes de cours,2013.* *- F. BOUDRAHEM, Recueil d'Exercices de Distillation-Rectification, Université de BEJAIA, 2014.*