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| **Type and description** | CE\_VP2 |
| **Course name** | Advances in Fluid Separation Processes |
| **Course name in Polish** | Innowacyjne procesy rozdzielania |
| **Language of instruction** | English |
| **Course coordinator and academic teachers** | prof. dr hab. inż. Andrzej Górak, TU Dortmund |
| **Form of classes and number of teaching hours** | **Lecture Tutorials Laboratory Project Seminar Other Total of teaching hours during semester**  Contact hours 40 15 5 0 0 0 60  E-learning No No No No No No  Assessment criteria (weightage) 0,00 0,00 |
| **Course organisation and content** | Part 1:  Lecture  Overview about the main methods for the calculation of vapour-liquid equilibrium for binary systems. activity coefficients in liquid phase. Batch distillation. Heat and Mass balances. Evaporation, vaporization and condensation. Continuous distillation. Determination of the number of theoretical stages. Binary absorption. Dimensioning of absorption column without heat effect. Packed columns. Liquid-liquid extraction. Adsorption and adsorbers.  Tutorials  Determination of the product composition in the batch distillation. Design of the distillation column under total and finite reflux conditions. Dimensioning of absorption column. Determination of the number of the extraction stages in the concurrent and counter current extraction. Design of the separation columns using the interactive simulation tool ChemSep. Analysis of the separation results using different operation modes of the distillation column. Separation of the industrial case study (benzene - styrene).  Part 2:  Lecture  Overview about the main methods for the calculation of vapour-liquid equilibrium for multicomponent systems (UNIFAC, UNIQUAC, Wilson etc). Methods for prediction of activity coefficients in liquid phase for multicomponent systems. Distillation lines and boundary distillation lines. Differences between them. Multicomponent distillation under real conditions. Design of distillation columns for multicomponent systems. Multicomponent absorption with heat effects, volatile solvent and vapour condensation. Fundamentals of multicomponent mass transfer. Reactive distillation. Industrial applications. Design case studies.  Tutorials  Comparison of different methods for calculation of vapour-liquid equilibrium for multicomponent systems. Design of distillation columns with side stream. Absorption with heat effect - design of the column.  Laboratory  Computer aided design of a sequence of distillation column using the software VESTO. Determination of boundary distillation lines. Determination of the feasible separation tray for multicomponent mixtures. Interactive design of the distillation column for the separation of close boiling substances. Revamping and debottlenecking of the column. Application of the computer aided design tool ChemSep. |
| **Assessment methods** | oral examination |
| **Basic reference materials** | A. de Haan, H. Bosch: Industrial Separation Processes, de Gryuter, 2017  Gorak, A.; Schoenmakers, H. "Distillation: Operation and applications", Elsevier, 2015  J .A. Wesselingh, R. Krishna: "Mass Transfer in Multicomponent Mixtures", VSSD, Delft, 2006 |
| **Other reference materials** | Kenig, E.; Górak, A.: "Modeling of Reactive Distillation" In: Modeling of process intensification (Eds. Keil, F.), Wiley-VCH, Weinheim, 2007;  Gorak, A.; Olujic, Z. “Distillation: Equipment and processes", Elsevier, 2015  Lutze, P.; Górak, A. (Eds.): "Reactive and Membrane-Assisted Separations", De Gruyter, 2016 |
| **Average student workload outside classroom** | 10h |
| **Comments** |  |
| **Last update** |  |