

Course Title:	Refinery process design and integration
Lecturer:	Prof. Ljubica Matijašević, Ph.D.
Course Type:	Compulsory
ECTS:	6
Total Hours:	30 hours
Content of the Course:	The content is focused on process integration as a systematic methodology of process implementation (design) with the aim of efficient use of energy/energy sources, raw materials and reduction of pollutant emissions. The course provides an overview of the techniques and skills of process integration based on pinch technology with case studies from the refinery practice. The impact of process integration on profitability – an economic analysis.
Competences:	<ul style="list-style-type: none"> • Understanding the flows of mass and energy through the process from the inflow of raw materials to the outflow of products/by-products/waste. • Recognition and locating of places in the process with the aim of saving mass/energy and reducing harmful emissions. • Application of an integrated approach to solving sustainable industrial activities – process modification. • Acquisition of techniques and skills of process integration. • Acquisition of techniques of cost-benefit analysis for specific activities.
Teaching Methodology:	Lectures, seminar (review of case studies)
Course Units:	<p>Process synthesis – tracing the mass flows through the process; Analysis of the process scheme – process simulation.</p> <p>The basics of the pinch analysis.</p> <p>Heat exchanger network (HEN) design.</p> <p>Heat pumps and CHP systems based on pinch technology.</p> <p>Mass exchange network (MEN) design.</p> <p>Techniques and hints for the reduction of water consumption and wastewater in the refinery.</p> <p>Economic analysis – cost-benefit analysis of system integration.</p> <p>Note: Each unit includes case studies from the refinery practice.</p>
Examination Method:	Written and oral exams
References:	<ol style="list-style-type: none"> 1. R. Smith, Chemical Process, Design and Integration, John Wiley & Sons, Inc., 2005. 2. W.D. Seider, J.D. Seader, D.R. Lewin, S. Widagdo, Product and Process Design Principles, John Wiley & Sons, Inc., 2010. 3. I.C. Kemp, Pinch Analysis and Process Integration, Elsevier 2007. 4. J. Klemeš, F. Friedler, I. Bulatov, P. Varbanov: Sustainability in the process industry, Integration and Optimization, McGraw Hill, 2011. 5. M.M. El-Halwagi, Pollution Prevention through Process Integration, Academic Press, 2003.
Course in English:	Yes
Quality Monitoring Method:	Course quality and performance monitoring in accordance with the quality management system of the University of Zagreb. Self-evaluation of lecturers and student poll.