Course title: **Chemical reactions engineering**

Institute/Speciality: **FACULTY OF CHEMICAL ENGINEERING AND TECHNOLOGY** / Engineering of Technological Processes

Number of contacthours: 30 hours (15h lectures + 15h excersises)
Course duration: 1 semester (spring)
ETCS credits: **3**

Course description: **Lectures content:** Introduction to chemical reactor engineering for homogenous processes. Elements of stoichiometry for a single chemical reaction and for complex processes. / Thermodynamic analysis of chemical processes. Thermodynamic functions of chemical reactions. / Fundamentals of kinetic analysis of chemical processes. Rate laws, relative rates of chemical reactions, temperature dependence of reaction rates. Methods for determination of the rate equations. / General mole balance for ideal isothermal tank reactors: batch reactor, continuous stirred tank reactor (CSTR) and cascade of CSTRs. / Non-isothermal non-adiabatic CSTR model. Autothermicity of the process. Elements of the dynamics of non-isothermal CSTR. / Flow patterns in tubular reactors: ideal and non-ideal flows. Plug flow reactor (PFR) model, dispersion model and laminar flow model. / Principles of selecting a reactor for a given process. Comparison of the performance of different types of reactors. **Excersises content**: Determination of a number of linearly independent chemical reactions. / Determination of a composition of reacting mixture for a single chemical reaction and for complex processes. / Calculation of a composition of an equilibrium mixture. / Determination of rate curves of chemical reactions. / Estimation of parameters in rate equations. / Design and sizing of an isothermal batch reactor, CSTR and cascade of CSTR. / Determination of steady states of non-isothermal non-adiabatic CSTR. Stability analysis of the steady. / Design and sizing of a plug flow reactor. / Comparison of the performance of different types of reactors.

Literature:
[1] O. Levenspiel — Chemical reaction engineering, New York, 1999, John Wiley & Sons
[2] S.H. Fogler — Elements of chemical reaction engineering, Upper Saddle River, 2005, Prentice Hall PTR

Assessment method: Tests and final exam
Prerequisites: Completed courses: Mathematics, Chemical engineering, Chemical reactors engineering, Numerical methods. Skills: Computer literacy; programming in selected high-level language e.g.: Fortran, basic knowledge of Matlab.
Primary target group: 4th Chemical Technology students/ 1st year of II cycle of study in Chemical Engineering

Lecturer: dr inż. K. Bizon, prof. PK, dr inż. Szymon Skoneczny
Contact person: dr inż. K. Bizon, prof. PK, e-mail: katarzyna.bizon@ pk.edu.pl

Deadline for application: 15th of January for spring semester
Remarks: The course runs regularly