G1774: Chemical Kinetics and Reactor Design

DESCRIPTION

This course covers the fundamentals of chemical reaction kinetics and the principles of reactor design for chemical processes. The subject consists of a theoretical part (60%) and a practical part (40%) developed in a computer simulation lab. The specific objectives to be achieved by the students are:

i) Training on the fundamentals of chemical reaction kinetics in homogeneous reactions,
ii) Identifying kinetic that establish the dependence of the reaction rate on the operation variables and kinetic parameters,
iii) Analysis of the performance, design and optimization of ideal homogeneous reactors,
iv) Dvelopment and solution of the mass, energy and momentum balances in ideal homogeneous reactors, and
v) Understanding the performance of chemical reactors with deviations from ideal flow patterns.

CONTENTS
1. Introduction to chemical reaction kinetics of homogenous reactions
2. Kinetic analysis of homogeneous reactions
3. Analysis and design of ideal isothermal reactors for homogeneous reactions
    3.1. Classification of ideal reactors: batch and continuous CSTR and PFR
    3.2. Development of mass balances
    3.3. Comparison of ideal reactors for simple and complex homogenous reactions
4. Analysis and design of ideal non-isothermal reactors for homogeneous reactions
    4.1. Development of energy mass balances
    4.2. Comparison of ideal reactors for simple and complex homogenous reactions
5. Characterization of reactors with deviations from ideal flow patterns

TEXTBOOKS:
- *O. Levenspiel "Ingeniería de las Reacciones Química" Limusa Wiley (2004).*
- *H.S. Fogler, Elements of Chemical Reaction Engineering, 4th Ed. Prentice Hall (2006)*
- *G.F.Froment, K.B.Brischoff " Chemical Reactor Analysis and Design " John Wiley (1990).*
- *E.B. Nauman "Chemical Reactor Design" Krieger Pub. Co. (1992).*
- *L.K. Doraiswamy, M.M.Sharma, "Heterogeneus reactions. Analysis, examples and reactor design" John Wiley & Sons (1984).*
- *Y.T. Shah "Gas-Liquid-Solid reactor design" McGraw-Hill Inc. (1979).*
- *J.J.Carberry, A.Varma "Chemical reaction and Reactor Engineering" Marcel Dekker (1987).*
- *H. Rase "Chemical Reactor Design for Process Plants" Ann Arbor (1992).*

SOFTWARE:
Polymath, Aspen Custom Modeler.