

REACTION AND SEPARATION ENGINEERING

1.1. Identification

University:	Kungliga Tekniska Högskolan (Stockholm)										
School:	School of Chemical, Science and Technology										
Course:	Reaction and Separation Engineering										
ECTS:	10.5										
Semester:	<i>Winter</i>			X	<i>Summer</i>			X			
Category	<i>Fundamental course</i>				X	<i>Specialisation course</i>					
Module	<i>MFI</i>	X	<i>MFII</i>		<i>MFIII</i>		<i>MSI</i>		<i>MSII</i>		<i>MSIII</i>
Teachers:	Lars Petterson										
Language:	<i>English</i>	X	<i>Italian</i>		<i>Swedish</i>	X	<i>Spanish</i>				

1.2. Learning-outcomes

- knowledge about industrial production processes based on reaction engineering and unit operation systems

1.3. Competencies

▪ General

- to analyse and solve complex problems on environmental issues of industrial processes
- to have critical understanding of technical and scientific tools
- to work and manage teams
- communication skills (both written and oral)
- to work in an international context

▪ Specific

- to achieve a deep understanding on the fundamentals in reaction and separation engineering
- to acquire skills in advanced correlations of kinetics, equilibria, diffusion, the conservation of mass and thermodynamics
- to apply the theoretical concepts for the analysis of advanced systems for the production of chemicals, heat or electricity.
- to determine the parameters that allow the design of industrial processes using reaction engineering and unit operation tools

1.4. Contents

Fundamental kinetic and reaction engineering concepts. Kinetics for electrode reactions. Multiple reactions and systems with volume change. Ideal reactor models

and models for catalytic reactors. Residence times and space velocities. Heterogeneous catalysis, enzymatic reactions and bioreactors. Fundamentals in separation engineering directed towards heat and mass transfer between two phases. Phase equilibria and the ideal stage principle. Distillation, absorption, adsorption and extraction. Evaporation and drying. Orientation about crystallisation and membrane separation processes. Orientation about equipment for separation techniques and for production of chemicals. Equipment for gas cleaning and for heat exchange. Electrochemical power sources. Choice and operation of ideal reactors.

1.5. Teaching Methodology

- Lecture sessions
- Practical sessions: “cooperative work” for solving problems
- laboratory sessions
- Course project

1.6. Evaluation

- written exams
- oral evaluation of the problems solved by “cooperative work”
- Evaluation of laboratory work
- Oral and written evaluation of the project

1.7. Bibliography

- Fogler, H.S., Elements of Chemical Reaction engineering. 4th ed., Pearson Education, Upper Saddle River, N.J., USA, 2005.
- Coulson, J.M. and Richardson, J.F., Chemical Engineering, Vol. 1, 6th ed., 2000 (bought in 3C1715) och Vol. 2, 5th ed., 2002
- Behm, M., Lagergren, C. Och Lindbergh, G., Elektrokemi för bränsleceller och batterier, Inst för kemiteknik, 2001.
- Övningsuppgifter i reaktions- och separationsteknik, Inst för kemiteknik, 2003.
- Diagramsamling, reaktions- och separationsteknik, Inst för kemiteknik, 2004