

Course Package

Membrane Technology

Name module	Membrane Technology
Educational programme	MSc Chemical Engineering
Period	First semester (Quarter 1A + 1B)
Study load	30 ECTS
Coordinator	A.S. Elbersen - Grote

Membrane Technology			
Quarter 1A	Quarter 1B	Quarter 2A	Quarter 2B
Advanced Colloids and interfaces (5 EC, Wood)	Electrochemistry (5 EC; Bouwmeester & Mei)		
Multi-component mass transport in water treatment (5 EC; Benes & Kemperman)			
Membranes for gas separation (5 EC; De Vos)			
Membrane process plant design (5 EC; Van der Ham)	Capita Selecta (5 EC; All lecturers)		

Required preliminary knowledge: Equilibria, Physical Chemistry, Fluid Dynamics, Heat and Mass Transfer, Separation Technologies, Matlab.

Membranes for gas separations

Membranes for Gas Separation is a course on membranes with a strong focus on membrane materials and molecular interactions. In most membrane based Gas Separations, the gas molecules will need to absorb in the membrane material, to be able to diffuse to the other side. In the absorption process affinity between membrane material and the gas can play an essential role. For other membranes, membrane pore sizes are so small that we achieve Molecular Sieving. In this course we teach how membranes are prepared and optimized for gas separation applications, how gas is transported through a variety of membranes, and how membrane materials and membrane processes can be strongly linked. This is done by a combination of lecturing and practical work.

Multi-component Mass Transport in Water Treatment

This course aims at understanding the mass transport in multi-component mixtures, based on a simplified version of the theory of Maxwell and Stefan. The main aim is for students to be able to understand the basic principles of diffusion in mixtures containing various different species, driven by a combination of different driving forces, and to apply this understanding in specific relevant chemical technology applications. Within the course a lot of attention is paid to contemplation and discussion, in order to consolidate the new knowledge and insights. Within this context, students are requested to give a lecture on one of the chapters

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in the book and to answer a relevant case study, in which the multi-component characteristics of transport are evident. The case study involves the use, and stepwise extension, of an existing Matlab code, allowing the students to gradually and relatively independently simulate and study an eventually complex problem.

Process Intensification Principles

This is a very interactive course in which the students will have an active role together with the Instructor and invited scientists. The emerging field of Process Intensification provides a set of tools and routes that can aid the industry in our current world to meet the demands imposed by global competition, government oversight and social accountability, with vast applications in, among others, mechanical and chemical engineering. Professionals with new ways of thinking as well as problem-solving skills are required by companies and universities, in order to tackle the wide range of societal challenges in general, and current limitations in chemical engineering in particular. It is crucial for a young professional of the future to have knowledge on actual chemical processes involving liquid, gas, and multiphase flows, for both small- and large-scale techniques. These professionals will be able to re-design existing plants or processes, or prepare “greenfield” solutions keeping the safety and ecological constraints in mind. All these elements are needed to convince management teams of the relevance to invest in these new solutions.

Membrane process plant design

The design and evaluation of an industrial scale (membrane) process plant based on a limited amount of information. The method taught for the analysis and design of chemical processes uses methods for ‘conceptual design’ and ‘process systems design’ which have been developed in the last twenty years. The lectures use fundamentals of this approach and translate them into applications in this case with a special focus on membrane processes.

Electrochemistry

No course description available yet.

Capita Selecta

Selected Topics in Chemical Engineering concern a specific assignment to investigate, explore or research a specific topic in this field. The assignment has to be concluded by a written report. The topic will be selected and tutored by a scientific staff member of a relevant research group. The duration of the assignment is 140 hours.