

Course: Chemical Reactor Engineering 2

credits: 5

Course code	CTVH26REACTOR2
Name	Chemical Reactor Engineering 2
Study year	2026-2027
ECTS credits	5
Language	Dutch, with parts in English
Coordinator	J.M. Meerdink

Modes of delivery	Teaching method 1
Assessments	Residence Time Distribution & Modeling Reactors - Computer, organised by STAD examinations Thermal Effects Reactors - Written, organised by STAD examinations

Learning outcomes

This module has the following learning outcomes:

- You process, analyse and interpret the results of tracer studies in terms of residence time distribution functions.
- You model real reactors based on the residence time distribution functions and use the model to predict the conversion in real reactors using the Excel software programme.
- You diagnose potential problems in reactors using the obtained residence time distribution.
- You determine the conditions for optimal production of the desired product in parallel and sequential reactions in ideal batch, tank and tubular reactors, where appropriate using the VisSim simulation package.
- You calculate mole and energy balances for flow reactors, isothermal and non-isothermal continuously stirred tank reactors and plug flow reactors, where appropriate using a simulation package such as VisSim.
- You determine the steady-state conditions for non-isothermal continuously stirred tank reactors and analyse 'runaway' effects.

Content

In the first part of the Reactor Engineering 2 module, 'Residence Time Distribution & Reactor Modelling', you will examine residence time distribution in ideal and non-ideal (real-world) reaction systems. You will learn to model real-world reactors and use these models to calculate conversion. The insights gained can also be used to identify reactor problems (reactor diagnosis). The following topics are covered in the first part:

- fractional and cumulative residence time distribution functions E and F
- average residence time, variation and skewness
- macro and micro mixing; mixing models
- modelling of non-ideal reactors
- zero-parameter model: segregation and maximum mixedness
- one-parameter model: tanks-in-series model

In the second part, Thermal Effects in Reactors, you will draw up an energy balance. You will use this to account for the temperature effects within the reactor on the progress of the reaction.

The content of Reactor Engineering 2 builds on the material covered in module 2.3.2, Reactor Engineering 1.

The Reactor Engineering 2 module covers the following components of the BOKS Chemical Technology curriculum:

Knowledge:

- Model reactors (batch, CSTR, plug flow) and non-ideal reactors
- Kinetics: order, temperature dependence of the reaction rate constant, reversible reactions, parallel reactions, consecutive reactions, reaction selectivity, reaction yield.
- Simulation & modelling
- Mass & energy balances

Skills:

- Use and application of simulation software and Excel

Included in programme(s)

Chemical Engineering

School(s)

Engineering, Life Sciences & ICT

