

**INSTITUTE OF LIFE SCIENCE & TECHNOLOGY**  
**EXCHANGE PROGRAMME RENEWABLE ENERGY, MATERIALS & PROCESSING**  
**MODULE: CATALYSIS 2017-2018**

Renewable energy, Materials & Processing	Year 4	Term
Theme coordinator	Dr. Ir. G. Lammers	
Instructor	Dr. E.W. Dijk	
Code	CTVH2CAT	
Content	This module is directly connected to the module Reactor Engineering 1. The module Catalysis deals with the kinetics and mechanisms of heterogeneous catalysis. This is most often applied to packed-bed reactors. There will be a brief treatment of Michaelis-Menten kinetics and aspects of homogeneous (enzymatic) catalysis.	
Learning Objectives	After completing this module, the successful student will be able to: <ul style="list-style-type: none"> <li>• Describe and diagram the Langmuir-Hinshelwood and Eley-Rideal mechanisms;</li> <li>• Identify the rate-limiting step for both mechanisms (Langmuir-Hinshelwood and Eley-Rideal) and prepare the reaction rate equations;</li> <li>• Describe and diagram Michaelis-Menten enzyme catalysis, and compare it to the Langmuir adsorption equation;</li> <li>• Describe how to properly setup and execute experiments for the determination of the reaction rate equation of catalytic reactions;</li> <li>• Derive the reaction rate equation from empirically determined data, and define the necessary parameters;</li> <li>• Design reactors for use in catalytic reactions (packed-bed reactors).</li> </ul>	
Competencies	Research (III), Experimentation (II), Self-Management (II)	
Level	In-Depth (II), Intermediate (III)	
Method of Instruction	Instructional lectures alternating 1 to 2 classes per week, 90 minutes each	
Language	English	
Literature	Elements of Chemical reaction Engineering, H. Scott Fogler, 4 <sup>th</sup> International ed., Prentice Hall (2005) C 10 Catalysis and Catalytic reactors p 645 - 697 C 4.5 Pressure Drop in Reactors p 175 - 195 C 5.5 Differential Reactors p 281 – 288 C 7.4 Enzymatic Reaction Fundamentals	
Web	Blackboard course Theme 14 CT <i>Research and Development</i> Blackboard course Theme 14 CT <i>Renewable Energy</i>	
Module type	Required	
Grading	Written examination with computer problems in SPSS & Excel (90 min). The level of the questions is comparable to the problems covered during the lessons and the practice exam, including catalytic reactor design/modeling.	
Course load (ECTS)	3	
Contact time	17 hours	

Self study time	67 hours
Prerequisites	-
Frequency	1× per academic year