

ADVANCED COURSE

Biocatalysis and Protein Engineering

17 - 21 April 2023

Ulf Hanefeld
Frank Hollmann
Caroline Paul
Adrie Straathof

AIM OF THE COURSE

The aim of the course is to familiarize participants with the integrated, interdisciplinary approach required to utilize the catalytic potential of enzymes and whole cells for the production of useful compounds. Organic chemists, enzymologists, microbiologists and (bio)chemical engineers from the faculty staff of Delft University of Technology and other universities, together with invited international experts from industry, will offer a selection of theory and practice. In this way, the course will provide an intensive and in-depth treatment of the state of the art and the necessary link between fundamental knowledge and practical applications in industrial scale processes.

All teachers of this course are experts in their topic and have been selected for their outstanding teaching qualities. The course thus provides all participants with up to date knowledge taught by approachable lecturers. The participants are invited to ask questions during and after the lectures and will be engaged in the learning process. This very personal approach is underlined by the fact that the group is small with a maximum of 35

participants. At the end of the course the participants will be well educated on all aspects of biocatalysis, from selection of the right biocatalyst, its production and improvement to reaction engineering. Additionally the participants will have made acquaintances with all experts in the fields and among each other providing many opportunities for future contacts.

COURSE DESCRIPTION

This one-week course is intensive and has long days. To ensure active participation by those attending, a combination of theoretical (lectures), practical demonstrations and practical work (exercises, case study) is offered. Some online preparatory materials will be given to ensure all have the same basic knowledge.

LECTURES

Lectures are setup to be interactive but active participation of the participants is of course vital to the success of the lectures. During the lectures attention will be paid to the following questions:

- When is biocatalysis the preferred method?
- Which type of biocatalysis should be used?
- How to obtain / improve this biocatalyst?
- Which reaction types can be carried out?
- How to perform and monitor the conversion?
- How to optimize the reaction conditions?

CASE STUDY AND WORKSHOP

For a better understanding of the lectures, the theory is applied in exercises on Tuesday in a case study. The workshops on Enzyme visualization / bioinformatics will be offered in two different levels, so even advanced participants will definitely be challenged! The course will be given in English.

WHO SHOULD ATTEND?

This Advanced Course is aimed at professionals (MSc, PhD or equivalent experience) in biochemical engineering, organic chemistry, fermentation technology, biochemistry or microbiology with a basic working knowledge of the other disciplines. The course is primarily aimed at those already employed in industry who wish to up-date their theoretical knowledge and practical insight in this field. In addition, this Advanced Course is an option in the two-year postgraduate programs of Delft University of Technology.



COURSE BOARD

Ulf Hanefeld
Biocatalysis
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Delft, the Netherlands

Frank Hollmann
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Delft, the Netherlands

Caroline Paul
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Adrie Straathof
Bioprocess Integration
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Delft, the Netherlands

COURSE COORDINATION

Jenifer Baptiste
BioTech Delft
Delft University of Technology
Delft, the Netherlands

LECTURERS

Dr. Alessandra Basso
Purilite
Cardiff, United Kingdom

Prof. Bernhard Hauer
Department of Technical Biochemistry
University Stuttgart
Stuttgart, Germany

Prof. Dick Janssen
Dept. of Biochemistry
University of Groningen
Groningen, the Netherlands

Dr. René de Jong
DSM Food and Beverage
Delft, the Netherlands

Dr. Mirjam Kabel
Wageningen University & Research
Wageningen, the Netherlands

Dr. Burghard König
Koenig & Funk Biotech Ltd., CEO
Berlin, Germany

Prof. Gerard Muyzer
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Dr. Sandy Schmidt
Dept. of Chemical and Pharmaceutical
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Dr. Martin Schurmann
InnoSyn B.V.
Geleen, the Netherlands

Prof. Roger Sheldon
University of the Witwatersrand,
Johannesburg, South Africa

Dr. Andreas Taglieber
Firmenich SA
Geneva, Switzerland

Dr. Oliver Thum
Evonik Industries AG
Essen, Germany

Prof. John Woodley
Technical University Denmark
Lyngby, Denmark

COORDINATORS WORKSHOP

Dr. Peter Leon Hagedoorn
Delft University of Technology
Delft, the Netherlands

PROGRAM

MONDAY 17 APRIL 2023

- 08.45 Registration
09.00 Outlook of the course and introductions
Ulf Hanefeld
09.30 Principles and applications of enantioselection
Caroline Paul
10.45 Industrial Applications of Biocatalysis for Antibiotic and Pharmaceutical synthesis
Burghard König
12.00 Case study: Hydrolysis - esterification - transesterification - aminolysis - perhydrolysis introduction - organic media - introduction enantioselection
Ulf Hanefeld
12.45 Lunch work-break
13.45 Team presentations case study
15.00 Engineering nature's enzyme repertoire for food, pharma and biofuels
René de Jong
16.15 Economics and Implementation of Biocatalytic Processes
John Woodley
17.30 Social drink and buffet

TUESDAY 18 APRIL 2023

- 09.00 Themes of the day
09.15 From natural environment to biocatalyst
Gerard Muyzer
10.30 Reaction engineering: optimizing the medium for enzymatic conversions
Caroline Paul
11.45 Novel enzymes and expanding the reaction space
Frank Hollmann
12.45 Lunch Bar 't Lab and group picture
13.45 Rational design and directed evolution of enzymes
Sandy Schmidt
15.30 Immobilization of biocatalysts
Roger Sheldon
17.00 End of day

WEDNESDAY 19 APRIL 2023

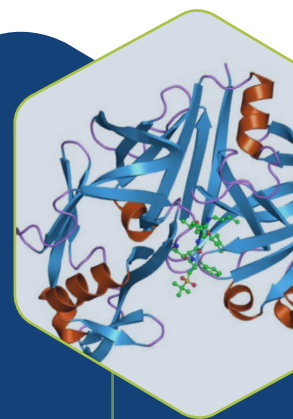
- 9.00 Themes of the day
9.15 Protein engineering: Protein engineering – enzyme stability – enzyme specificity – optimisation of biocatalytic characteristics
Dick Janssen
10.30 Genomic databases, bioinformatics and biocatalysis: Genome sequences - database searches - structure prediction – sequence analysis - screening
Dick Janssen
11.30 Non-aqueous biocatalysis
Ulf Hanefeld
13:00 Lunch break
14.15 Biocatalysis - A tool for sustainable production of ester-based surfactants
Oliver Thum
15.30 Computer practical: PyMOL
Peter Leon Hagedoorn
18.00 End of day

THURSDAY 22 APRIL 2023

- 09.00 Themes of the day
09.15 From biotransformation towards industrial process
Adrie Straathof
11.30 Industrial applications of immobilized enzymes
Alessandra Basso
12.45 Lunch Bar 't Lab
13.45 Fundamentals and application of BioRedox Catalysis
Frank Hollmann
15.00 Enzymes for lignocellulose degradation
Mirjam Kabel
16.00 Enzyme-catalysed synthesis of C-C bonds: hydroxynitrile lyase/oxynitrilase
Ulf Hanefeld
16.45 Plenary discussion
18.30 Course dinner

FRIDAY 21 APRIL 2023

- 09.00 Themes of the day
09.15 Biocatalytic reduction reactions
Frank Hollmann
10.15 Biocatalytic oxidation and oxyfunctionalization reactions
Frank Hollmann
11.15 Biocatalytic processes to oxyfunctionalised products
Martin Schürmann
12.15 Lunch
13.00 Biocatalysts for the synthesis of chiral amines
Bernhard Hauer
14.15 An industrial perspective from the world of flavors and fragrances
Andreas Taglieber
15.15 Evaluation of the course
Frank Hollmann
15:30 Farewell drink



LOCATION

The course will be held at the Delft University of Technology Department of Biotechnology Van der Maasweg 9 2629 HZ Delft, The Netherlands <http://bt.tudelft.nl>

ACCOMMODATION

Hotel accommodation can be arranged at your request addressed to biotechdelft@tudelft.nl.

COURSE REGISTRATION

Please register via the website to attend the course. Deadline for application is **27 March 2023**. Applicants will be handled in order of the date of receipt.

COURSE FEE

€ 2.500 in case booking is made before **6 February 2023** or € 2.750 in case booking is made after this date. In the event of cancellation before **20 February 2023**, a full refund will be granted, after this date, a 25% fee charge can be made.

To facilitate enrolment of young PhD-students from universities, a limited number of fellowships is available. The course fee with fellowship is € 1.250. To apply, please include a copy of your registration as a PhD-student from your university.

The fee includes course materials, lunches, the buffet on Monday and the course dinner on Thursday. The fee does not cover other meals and lodging.

When the number of participants is too low to have a fruitful course, BioTech Delft will cancel the event no later than six weeks before the start of the course. The course fee will be reimbursed within three weeks after cancellation.

In case a speaker will not be able to present his/her lecture due to unforeseen circumstances, BioTech Delft will arrange an equivalent replacement.

Hotel accommodation can be arranged at your request.

Preparatory texts will be send a month before the start of the course. The complete digital course book will be supplied at the start of the course.



BioTech Delft organises biotechnology education at postgraduate level. BioTech Delft closely cooperates with the department of Biotechnology of Delft University of Technology. Since its foundation, in 1987, BioTech Delft has very successfully organised various types of postdoctoral education.

Currently BioTech Delft offers Advanced Courses given each year, covering the multidisciplinary spectrum of biotechnology. The courses have a long track-record dating back to 1988.

- *Microbial Physiology and Fermentation Technology (1988)*
- *Downstream Processing (1989)*
- *Biocatalysis and Protein Engineering (1999)*
- *Environmental Biotechnology (1993)*
- *Bioprocess Design (2014)*
- *Modelling and Computation for Microorganisms in Bioprocesses (2018)*
- *Integrated Multi-Omics approaches for Improvement of Industrial Microbes (2020)*

FURTHER INFORMATION

Jenifer Baptiste, BA

Course coordination

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Advanced
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