

**ADVANCED COURSE**

# Multi-Omics approaches for Improvement of Industrial Microbes

**1 - 5 June 2026**

Aljoscha Wahl  
Djordje Bajić  
Martin Pabst

## **AIM OF THE COURSE**

This course offers a coherent overview of current state of the art omics technologies, bridging the different cellular levels, i.e. metabolomics, fluxomics, transcriptomics and proteomics. It will be shown how integrated application of these technologies provides holistic, quantitative insights in cellular physiology. Finally, it will be demonstrated how targets for (further) improvement of industrial microbes can be identified through integration of omics data with modelling approaches.

The courses of the Department of Biotechnology at the Delft University of Technology has been known for more than 35 years. Teachers from universities and experts from industries will share their new insights in the field and give you insights they acquired during their career. Throughout the course you will practise with the newly gained knowledge by yourself, to optimize your learning.

The first two days of the course are mainly dedicated to experimental techniques and data acquiring. From experimental design to mass spectrometry to transcript assembly.

The next two days focus on theoretical and modeling aspects of Systems Biology. Approaches from network reconstruction, stoichiometric and thermodynamic network analysis and in-vivo kinetic modeling will be covered.  $^{13}\text{C}$  tracer methods will be discussed to increase the information content of stationary state as well as dynamic experiments.

Day five will be dedicated to future perspectives for systems biology and industrial application of multi-omics approaches.

## COURSE DESCRIPTION

This one-week course is taught in English and has intensive and long days. To ensure active participation by those attending, a combination of theoretical (lectures) and practical work (exercises and computer simulations) is offered. Some online preparatory materials will be offered to facilitate all participants having the same start knowledge.

## LECTURES

In the lectures, attention will be paid to the following themes:

- Genome sequencing and analysis
- Transcriptomics (incl. RNA sequencing)
- Microbial proteomics
- Bioinformatics
- Novel molecular tools and automated strain construction
- Rapid sampling and quenching
- Metabolite quantification and validation using Isotope Dilution Mass Spectrometry (IDMS)
- Estimation of extra- and intracellular rates from experimental data
- Kinetic modeling and approaches to handle parameter identification problems
- Genomics in strain improvement (incl. metabolic and evolutionary engineering)

## EXERCISES AND COMPUTER SIMULATIONS

The participants will apply the theory from lectures in case study exercises, especially for concepts from bioinformatics, quantitative metabolomics and metabolic modeling. The participants will focus on analysis of next-generation sequence data, massive data handling, statistics, interpretation and visualisation of multi-omics data.

## WHO SHOULD ATTEND?

This Advanced Course is aimed at participants from industry, universities and research institutions who want to update and extend their theoretical knowledge and practical insight in multi-omics and modeling. The course is intended for postgraduates (MSc, EngD, PhD), with a sound background in microbiology, microbial physiology, biotechnology, biochemistry or biochemical engineering, with a basic knowledge in some of the other disciplines and an affinity to applied mathematics.

## COURSE BOARD

Aljoscha Wahl  
Friedrich Alexander Universität Erlangen  
Nürnberg, Germany

Djordje Bajić  
Industrial Microbiology  
Delft University of Technology  
Delft, the Netherlands

Martin Pabst  
Environmental Biotechnology, High-resolution  
Mass Spectrometry  
Delft University of Technology, the Netherlands

## TU DELFT BIOTECHNOLOGY

Marcel van den Broek  
Timmy Paez Watson  
Berdien van Olst  
Marieke Klijjn

## COURSE COORDINATION

Yvonne van Gameren  
Jenifer Baptiste  
BioTech Delft  
Delft University of Technology  
Delft, the Netherlands

## LECTURERS

Frank Bruggeman  
Systems Biology Lab  
Vrije Universiteit Amsterdam  
Amsterdam, the Netherlands

Jeroen Demmers  
Erasmus MC  
Rotterdam, the Netherlands

Douwe Molenaar  
Biochemistry and Molecular Biology  
Vrije Universiteit Amsterdam  
the Netherlands

Hector Garcia Martin  
Lawrence Berkeley National Laboratory  
Berkeley, USA

Barbara Kozak  
IFF Health & Biosciences  
Oegstgeest, the Netherlands

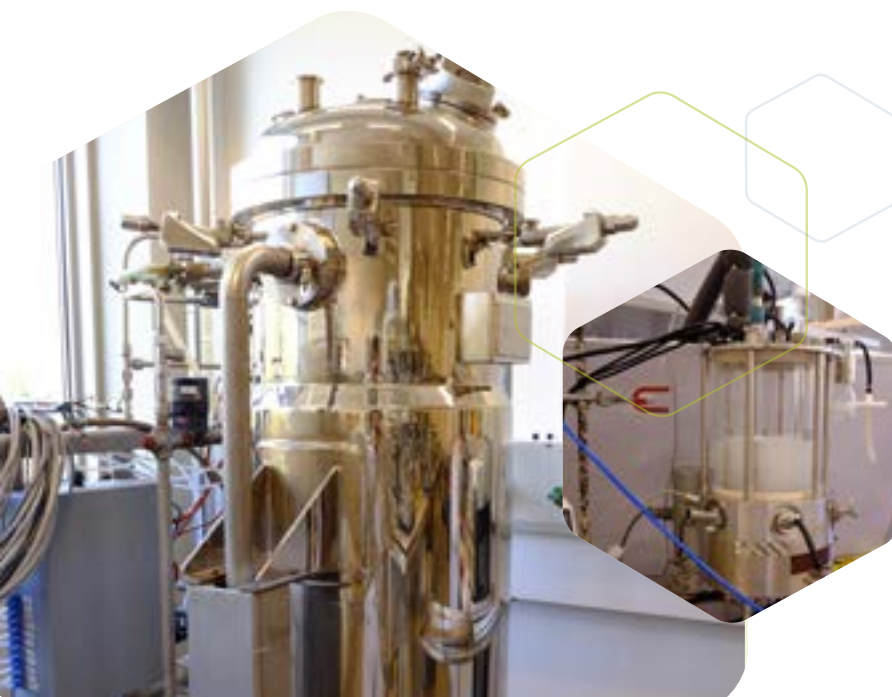
Bas Teusink  
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Alexander Wittenberg  
KeyGene  
Wageningen, the Netherlands

Koen Verhagen  
dsm-firmenich  
Delft, The Netherlands

Hannes Link  
University of Tübingen  
Tübingen, Germany

Eduard Kerkhoven  
Chalmers University of Technology  
Gothenburg, Sweden



# PROGRAM

## MONDAY 1 JUNE 2026

Theme: Omics technologies: Overview and state of the art

- 08:30** Registration
- 09:00** Introduction, including motivation for multi-omics analysis  
*Djordje Bajić*
- 09:15** Reveal and understand natural variation using long-read sequencing technologies  
*Alexander Wittenberg*
- 10:30** Introduction to genome analyses  
*Djordje Bajić*
- 11:30** Genome analyses I  
*Marcel van den Broek & Djordje Bajić*
- 12:30** Lunch & picture
- 13:30** Genome analyses II  
*Marcel van den Broek & Djordje Bajić*
- 17:00** RNA sequencing and transcriptomics  
*Eduard Kerkhoven*
- 19:00** Social drink and buffet

## TUESDAY 2 JUNE 2026

Theme: Mass spectrometry based proteomics & metabolomics techniques

- 09:00** Genome analyses III  
*Marcel van den Broek & Djordje Bajić*
- 11:15** Cellular proteomics, introduction and theory  
*Martin Pabst*
- 12:30** Lunch
- 13:30** Proteomics data analysis exercise  
*Martin Pabst*
- 15:45** Targeted proteomics  
*Jeroen Demmers*
- 15:45** Metabolomics methods  
*Hannes Link*
- 17:00** Optional lab tour genomics proteomics

## WEDNESDAY 3 JUNE 2026

Theme: Fluxomics & Modelling approaches

- 09:00** Metabolomics and metabolic networks (theory and links)  
*Aljoscha Wahl*
- 10:15** Genome-scale modelling for *in-silico* analysis of metabolism  
*Bas Teusink*
- 11:30** Introduction to Cobra  
*Aljoscha Wahl*
- 12:00** Lunch
- 13:00** Exercise with open source tools (Cobra)  
*Aljoscha Wahl*
- 14:30** Multi omics in industrial environment (with examples)  
*Koen Verhagen*
- 15:45** Resource allocation and microbial life cycle strategies  
*Timmy Paez Watson*
- 16:30** Resource allocation - exercise/case study  
*Timmy Paez Watson*

## THURSDAY 4 JUNE 2026

Theme: Integration of omics data & Modelling approaches

- 09:00** Resource allocation and microbial life cycle strategies  
*Douwe Molenaar*
- 10:15** Regulatory functions of the metabolomic network  
*Frank Bruggeman*
- 11:30** Introduction to Copasi  
*Aljoscha Wahl*
- 12:45** Lunch
- 13:45** Continuation: Copasi
- 14:30** Theme group discussions & questions (parallel)  
*Aljoscha Wahl/Martin Pabst/Djordje Bajić*
- 15:30** Machine learning for industrial biotechnology  
*Hector Garcia Martin (online)*
- 18:00** Course Dinner

## FRIDAY 5 JUNE 2026

Theme: Future perspectives

- 09:30** Advanced multi omics in *Lactococcus*: from laboratory to industrial conditions  
*Berdien van Olst*
- 10:45** Analytics or scalable red blood cell cultivation  
*Marieke Klijn*
- 11:45** Lunch
- 12:45** Taming *Trichoderma reesei* for industrial needs  
*Barbare Kozak*
- 14:00** Closing lecture  
*tba*
- 15:00** Evaluation & Certification



### LOCATION

The course will be held at the Delft University of Technology Department of Biotechnology Van der Maasweg 9 2629 HZ Delft, The Netherlands

## COURSE REGISTRATION

Please register via the website to attend the course. Applicants will be handled in order of the date of receipt.

## COURSE FEE

The course fee can be found on the [website](#). 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.

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



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**BioTech Delft** organises courses in biotechnology 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 various 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)*
- *Bioprocess Design\* (2014)*
- *Modelling and Computation for Microorganisms in Bioprocesses (2018)*
- *Multi-Omics approaches for Improvement of Industrial Microbes (2020)*
- *Cellular Agriculture: Precision fermentation and cultured meat (2024)*
- *EPS for resource recovery (2025)*
- *Biopharmaceutical Bioprocessing (2025)*

\* in partnership with Wageningen University & Research

## FURTHER INFORMATION

Jenifer Baptiste, BA

Course coordination

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