



Advanced course for (MSc/PhD) students and industry professionals

## Metabolomics for Microbial Systems Biology

Methods of **QUANTITATIVE METABOLOMICS**; insights into complex **METABOLIC CONTROL** of central carbon metabolism and **PRODUCT FORMATION PATHWAYS** in industrial micro-organisms

Metabolomics and fluxomics are new and exciting field of "omics" research aiming at a comprehensive understanding of biological systems, thereby providing a characterization of the metabolic status and its regulation. The course covers recent developments in rapid sampling methods, measurement techniques and modelling approaches for microbial systems:

The **first two days are mainly dedicated to experimental approaches**, (1) bioreactor cultivation from steady-state analysis to stimulus response experiments. (2) Proper sampling and sample handling procedures for reliable and reproducible metabolome analysis will be discussed and exercise calculations are performed. (3) The main measurement techniques addressed are based on liquid and gas chromatographic separation, coupled to mass spectrometry. A lecture on NMR is also included.

The **3rd and 4<sup>th</sup> day focus on theoretical and modelling aspects** of Systems Biology. Approaches ranging from (1) stoichiometric and (2) thermodynamic network analysis and (3) *in-vivo* kinetic modelling will be covered. Additionally, (4) <sup>13</sup>C tracer methods will be discussed to calculate intracellular fluxes at steady-state as well as under dynamic conditions.

The **last day will be dedicated to future developments and recent applications** of quantitative metabolomics to tackle specific biological questions.

**Materials:** Hand-outs and literature references.

**Time & place:** 23 to 27 February 2015. Location: Department of Food Engineering (FEA) at Unicamp, Campinas, Brazil

**Examination:** Individual exercise, marked following the usual Unicamp system. Unicamp students: 3 credits (code BI100).

**Audience:** Course is open for postgraduates (from industry, universities, institutes) with sound background in microbiology, microbial physiology, biotechnology, biochemistry or biochemical engineering.

**Language:** This course will be given in English. Course materials will also be in English.

**Enrolment:** No fee is charged for this course. Students and non-students enrol by registering via [brazil@tudelft.nl](mailto:brazil@tudelft.nl).

**Partners:** Brazil: UNICAMP, USP. Netherlands: Delft University of Technology, BE-Basic, BSDL.

**Information:** Prof. Andreas Gombert (FEA|UNICAMP) or [brazil@tudelft.nl](mailto:brazil@tudelft.nl).

