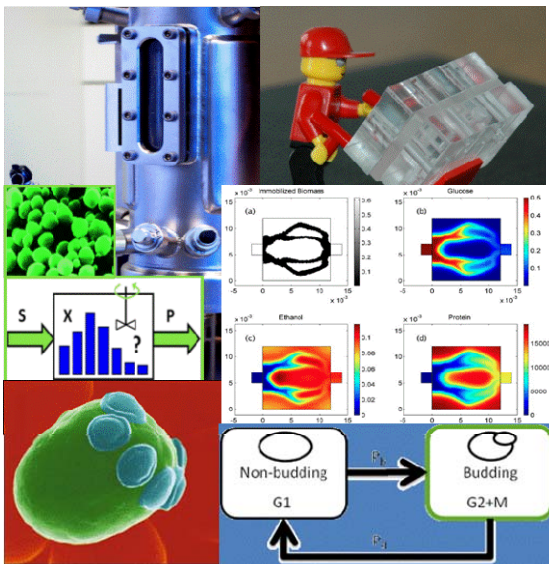




4th PhD course Measurement, modelling and control in biochemical engineering

July 3-5, 2017

TU Wien, Vienna, Austria



We cordially invite to the beautiful city of Vienna! We are offering you a unique hands-on course to provide insight into measurement, monitoring, modelling and control (M3C) applied to biochemical processes.

The course is supported by the M3C section of ESBS, and by the Quality-by-Design Working Party of the EFCE.

Please find more information under <http://esbes.org/Courses.html>

Scope and form:

Three days of teaching and computer exercises. Course material and computer codes are supplemented with an additional set of reading material.

Lectures by an international team of experts:

Christoph Herwig (TU Wien, Austria)

Jarka Glassey (Newcastle University, UK)

Bernd Hitzmann (University Hohenheim, Germany)

Krist V. Gernaey (Technical University of Denmark, Denmark)

Course credits: 2.0 ECTS

Course fee and registration:

The course fee includes relevant course materials, lunches and coffee breaks.

PhD students: 300 Euros

Industrial participants: 600 Euros

Participants are expected to cover their own travelling and accommodation expenses, as well as to bring a laptop, preferably with Matlab installed.

Course registration:

Please register directly at:

<https://interconvention.eventsair.com/phdcourse/onlineform>

Registration Deadline 18th June 2017

Venue:

Vienna University of Technology

Getreidemarkt 9

A-1060 Wien, Austria

Conference Room: Building BA Room 02 A

Accommodation (self-payable):

We reserved (not included in fee) rooms in

Motel One Oper: <http://www.motel-one.com/de/hotels/wien/wien-staatsoper>

Please mention "M3C Course".

For additional information:

Jarka Glassey, jarka.glassey@ncl.ac.uk

Christoph Herwig, christoph.herwig@tuwien.ac.at

Additional related course information:

If you are interested in hybrid modelling, an additional course on this topic is organised by M3C, EUFEPS and Evon in Vienna from the 5-7 July 2017. More information can be found on <http://esbes.org/Courses.html>

Course program:

| Day 1 | Topic |
|-------------|---|
| 9:00-10:30 | Introduction to biochemical engineering Processes – Process development principles (Krist V. Gernaey) |
| 10:30-10:45 | Break |
| 10:45-12:00 | Basic principles of PAT and QbD (Jarka Glassey) |
| 12:00-13:00 | Lunch break |
| 13:00-14:30 | Bioprocess instrumentation, advanced measurement techniques and data quality (Bernd Hitzmann) |
| 14:30-14:45 | Break |
| 14:45-16:15 | Data collection in bioprocessing (1): Operating principles of advanced on-line sensors – univariate versus multivariate data (Krist V. Gernaey) |
| 16:15-16:45 | Break |
| 16:45-18:00 | Data collection in bioprocessing (2): Getting most out of your sensors: data pre-processing, PCA, PLS (Jarka Glassey) |
| 19:00 | Dinner |

| Day 2 | Topic |
|-------------|--|
| 8:30-10:15 | Workflow of good modelling practice, minimum model building (Christoph Herwig) |
| 10:15-10:45 | Break |
| 10:45-12:00 | Mechanistic models of biochemical engineering processes : Model implementation, parameter estimation, differential sensitivity analysis (Krist V. Gernaey) |
| 12:00-13:00 | Lunch break |
| 13:00-14:00 | Optimal experimental design based on Fisher information (Bernd Hitzmann) |
| 14:00-14:15 | Break |
| 14:15-15:45 | Observers, Kalman filters and their use, advantages and limitations in bioprocessing (Bernd Hitzmann) |
| 15:45-16:15 | Break |
| 16:15-18:00 | Bioprocess control, MPC, constraints, objective functions, control architectures (Christoph Herwig) |
| 19:00 | Dinner |

| Day 3 | Topic |
|-------------|--|
| 8:30-10:15 | Soft sensors, their applicability in bioprocess monitoring and control (Christoph Herwig) |
| 10:15-10:30 | Break |
| 10:30-11:30 | Case study: PAT methodology in cell culture development and biologics manufacture (Jarka Glassey) |
| 11:30-12:30 | Uncertainty and global sensitivity analysis in a PAT context (Krist V. Gernaey) |
| 12:30-13:30 | Lunch break |
| 13:30-14:45 | Case study: Fluorescence measurement in yeast cultivations (Bernd Hitzmann) |
| 14:45-15:30 | Course evaluation, questions and answers |