BioProcess Digital

PROFESSIONAL COURSES IN BIOPROCESS ENGINEERING

Bioprocess engineering basic principles

Material and energy balances, fluid flow and residence time distribution, mass and heat transfer, enzymatic and cellular kinetics

Online course: organized on-demand

Course fee: 350 € per session

Course content

8 sessions: sessions can be taken separately

Effort: 4 - 8 h per session

COURSE OBJECTIVE

The course provides a comprehensive overview of the scientific basis of bioprocess engineering. It covers the essential concepts and methods for bioprocess simulation, scale-up, and design.

The course offers a combination of methodological presentations, exercises, and case study problems.

INSTRUCTOR

Jean-Marc Engasser, BioProcess Digital

DIGITAL LEARNING

- Learning platform with course resources
- Recorded slideshow presentations
- Case studies on spreadsheets templates with guides
- Online collective or one-to-one tutoring

COURSE PROGRAM

Session 1: Material balances
- Initial-final and instantaneous mass balances. Principle of mass conservation
- Use of material balances for kinetic analysis, simulation, and sizing of bioreactors

Session 2: Energy balances
- Initial-final and instantaneous energy balances. Mechanical energy and heat
- Use of energy balances for energy consumption evaluation and temperature simulation

Session 3: Fluid flow in bioprocesses
- Principle of momentum conservation and transfer. Newtonian and non-newtonian fluids. Laminar and turbulent flows
- Application to flow in pipes and tanks agitation. Evaluation of energy consummptions.

Session 4: Residence time distribution
- Residence time distribution (RTD) concept. Experimental RTD analysis and flow models
- Influence of RTD on continuous bioreactor and sterilizer sizing

Session 5: Mass transfer
- Mass transfrer rate laws by diffusion and convection. Concept of mass transfer resistances
- KInetic analysis and simulation of solute diffusion in solids, and oxygen transfer in bioreactors

Session 6: Heat transfer
- Heat transfer rate laws by conduction, convection, and radiation. Concept of heat transfer resistances
- Evaluation of heat transfer rates and temperature profiles across solids

Session 7: Enzymatic bioconversion kinetics
- Kinetic laws for enzymatic reactions and enzyme denaturation. Influence of temperature
- Kinetic analysis and simulation of enzymatic bioconversions in bioreactors

Session 8: Microbial or cellular transformation kinetics
- Kinetic laws of cellular growth, substrates consumption, and metabolites production
- Kinetic analysis and simulation of cellular transformations in bioreactors