

Industrial Biotechnology (I002612)

Wegens Covid19 kan mogelijk afgeweken worden van de onderwijs- en evaluatievormen. Dergelijke afwijkingen zullen via Ufora worden gecommuniceerd.

Cursusomvang *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 5.0 **Studietijd** 150 u **Contacturen** 50.0 u

Aanbodsessies in academiejaar 2021-2022

A (semester 1) Engels Gent

Lesgevers in academiejaar 2021-2022

Soetaert, Wim LA25 Verantwoordelijk lesgever

Aangeboden in onderstaande opleidingen in 2021-2022

	stptn	aanbodssessie
Master of Science in Bioinformatics (afstudeerrichting Bioscience Engineering)	5	A
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	5	A
Master of Science in de bio-ingenieurswetenschappen: chemie en bioprocestechnologie	5	A
Master of Science in de bio-ingenieurswetenschappen: levensmiddelenwetenschappen en voeding	5	A
Uitwisselingsprogramma Bioinformatics (niveau master)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: chemie en bioprocestechnologie (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: Food Science and Nutrition (niveau master-na-bachelor)	5	A

Onderwijstalen

Engels

Trefwoorden

Screening, growth kinetics, fermentors, bioreactors, aeration, substrates, genetics, mutations, recombination, enzyme technology, biocatalysis, bioconversion, bioreactors, solvents

Situering

This course deals with the underlying principles of the industrial exploitation of fermentation and bioconversion processes. Kinetic, physiological, genetical as well as process technological aspects are discussed. These principles are then exemplified with some industrial case-studies. The principles of biocatalytic processes and enzyme technology and its industrial applications are also widely discussed. The practical training includes the computing of fermentation and biocatalysis parameters and visits to fermentation industries.

Inhoud

1. General introduction to industrial microbiology and biotechnology
 - ° Production of microbial biomass, enzymes, primary and secondary metabolites
2. Microbial nutrition and substrates for industrial fermentation
 - ° Carbon sources
 - ° Nitrogen sources
 - ° Minerals, vitamins and growth factors
 - ° Chelators and buffers
 - ° Medium optimisation
 - ° Medium sterilisation
3. Growing micro-organisms on an industrial scale
 - ° General introduction to microbial growth kinetics
 - ° Inoculum preparation and fermentation build-up

- Measurement of microbial growth and microbial metabolites
- Agitation and aeration
- Foam and pH control
- Batch fermentation
- Scale-up of industrial fermentation
- Continuous culture
- Fed batch fermentation
- High cell density fermentation
- Solid state fermentation
- 4. Development of industrial micro-organisms
 - Safekeeping of industrial strains
 - Microbial culture collections
 - Screening in nature and metagenomics
 - Mutation, genetic engineering and selection of industrial micro-organisms
- a. Techniques for random mutation of micro-organisms
- b. Transformation
- c. In-vivo recombination
- d. In-vitro recombination and rDNA technology
- e. Selection and screening techniques
- 5. Metabolic deregulation and metabolic engineering of industrial micro-organisms
 - Metabolic control and regulation of microbial flux
 - Metabolic deregulation for overproduction of microbial metabolites
 - Metabolic engineering and modelling
 - Synthetic biology
- 6. Down-stream processing; product recovery from fermentation broths
 - Biomass separation
 - a. Centrifugation
 - b. Microfiltration
 - c. Filtration
 - Product recovery
 - a. Extraction
 - b. Crystallisation
 - c. Precipitation
 - d. Evaporation
 - e. Membrane processes
 - f. Chromatography

Begincompetenties

Industrial Biotechnology builds on the learning outcomes of course units Chemistry 1: Structure of Matter, Chemistry 2: Reactivity of Matter, Chemistry 3: Organic Chemistry - structure, Chemistry 3: Organic Chemistry - reactivity, Biochemistry and Molecular Biology, Microbiology ; or the learning outcomes have been achieved differently.

Eindcompetenties

- 1 Distinguish nutritional needs and growth media of microorganisms
- 2 Applying the basic principles of microbial fermentation technology
- 3 Explain the directed metabolic and genetic engineering of microorganisms
- 4 Have insight in downstream processing technologies for the recovery and purification of microbial products

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Begeleide zelfstudie, excursie, hoorcollege, werkcollege: PC-klasoefeningen

Leermateriaal

A written course is available; a few reference books are recommended. Cost: 15 EUR

Referenties

SIKYTA, B., 1995

Techniques in Applied Microbiology
Progress in Industrial Microbiology, vol 31,
Elsevier (ISBN 0444-98666-9)

DEMAIN, A.L. and DAVIES, J.E. (Eds.) 1999
Manual of Industrial Microbiology and Biotechnology
ASM-Press, USA (ISBN -1-55581-128-0C)

RATLEDGE, C. and KRISTIANSEN, B. (Eds.) 2001
Basic Biotechnology (2nd ed.)
Cambridge University Press (ISBN -0521-77917-0)

STRAATHOF, A.J.J. and ADLERCREUTZ, P. 2000
Applied Biocatalysis (2nd ed.)
Harwood Academic Publ. (ISBN -90-5823-023-6)

WAITES, M. J., MORGAN, N., L, ROCKEY, J. S. and HIGTON, G., 2001
Industrial Microbiology: an introduction
Blackwell Science (ISBN 0632-05307-0)

Vakinhoudelijke studiebegeleiding

Evaluatiemomenten

periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijk examen met open vragen, schriftelijk examen, mondeling examen

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijk examen met open vragen, schriftelijk examen, mondeling examen

Evaluatievormen bij niet-periodegebonden evaluatie

Tweede examenkans in geval van niet-periodegebonden evaluatie

Niet van toepassing

Toelichtingen bij de evaluatievormen

Theoretic exam: written and oral

Practical exam: PC exercise (closed book)

Eindscoreberekening

Theoretical exam: 80%

Practical exam: 20%

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.