

Biocatalysis and Enzyme Technology (I000572)

Course size (nominal values; actual values may depend on programme)

Credits 5.0 Study time 135 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	guided self-study	6.25 h
		lecture	23.75 h
		seminar: practical PC room classes	15.0 h
		practicum	15.0 h

Lecturers in academic year 2018-2019

Desmet, Tom LA25 lecturer-in-charge

Offered in the following programmes in 2018-2019

	crdts	offering
Bachelor of Science in Bioscience Engineering (main subject Cell and Gene Biotechnology)	5	A
Bachelor of Science in Bioscience Engineering (main subject Chemistry and Food Technology)	5	A

Teaching languages

Dutch

Keywords

Biocatalysis, bioconversion, enzyme technology, engineering, immobilisation, bioreactions in solvents, industrial applications

Position of the course

This course deals with the principles of biocatalysis. Procedures for the development and optimization of biocatalytical processes are described, and a number of industrial case-studies are presented.

Contents

CHAPTER I. INTRODUCTION

- I.1. Definitions
- I.2. A short history of biocatalysis
- I.3. Advantages of biocatalysis
- I.4. Prejudices against biocatalysis
- I.5. Markets and applications

CHAPTER II. ENZYMOLOGY

- II.1. Enzyme classification
- II.2. Enzyme mechanism
- II.3. Enzyme kinetics
- II.4. Biocatalytic concepts

CHAPTER III. BIOCATALYST DEVELOPMENT

- III.1. General criteria
- III.2. Selection and screening
- III.3. Enzyme engineering
- III.4. Medium engineering
- III.5. Reactor engineering

CHAPTER IV. BIOCATALYST PRODUCTION

- IV.1. Fermentation
- IV.2. Down-stream processing

IV.3. Formulation
IV.4. Immobilisation

CHAPTER V. BIOCATALYTIC REACTIONS

V.1. Oxidoreductases
V.2. Transferases
V.3. Hydrolases
V.4. Lyases
V.5. Isomerases
V.6. Ligases

CHAPTER VI. CASE STUDIES

VI.1. High-fructose corn syrup
VI.2. Second generation bioethanol
VI.3. Semi-synthetic antibiotics
VI.4. Acrylamide and nicotinamide
VI.5. Aspartame and aspartate
VI.6. Isomaltulose and other sugar substitutes
VI.7. Cacao butter and modified fats
VI.8. Optically pure alcohols and aminoacids
VI.9. Chloropropionic acid and epoxides

Initial competences

Biocatalysis and Enzyme Technology builds on certain learning outcomes of course unit 'Chemistry 3: Organic Chemistry - structure', 'Chemistry 4: Organic Chemistry - reactivity', 'Biochemistry and Molecular Biology' and 'Microbiology' ; or the learning outcomes have been achieved differently.

Final competences

- 1 The students will acquire a thorough knowledge of the principles of enzyme technology.
- 2 The students will acquire a thorough knowledge of the industrial applications of biocatalysis.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, lecture, practicum, seminar: practical PC room classes

Extra information on the teaching methods

Theory: oral lectures
Exercises: lab, PC-room

Learning materials and price

A written course is available; some reference books are recommended.

References

BUCHHOLZ K, KASCHE V and BORNSCHEUER UT (2005)
Biocatalysts and Enzyme Technology
Wiley VCH (ISBN 3-527-30497-5)

BOMMARIUS AS, and RIEBEL BR (2004)
Biocatalysis: Fundamentals and Applications
Wiley VCH (ISBN 3-527-30344-8)

LIESE A, SEELBACH K, WANDREY C (2006)
industrial Biotransformations, 2nd edition
Wiley VCH (ISBN 3-527-31001-0)

Course content-related study coaching

The students can ask questions personally or by email to the professor or the assistants.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination

Examination methods in case of periodic evaluation during the second examination period

Written examination

Examination methods in case of permanent evaluation

Participation, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

Theory: written examination

Exercises: lab report, contribution to the discussions

Calculation of the examination mark

Theory: period aligned evaluation (90%)

Exercises: non-period aligned evaluation (10%)