

Module Handbook (<https://modhb.uni-kl.de/>)

TUK (<https://www.uni-kl.de>) MODHB (<https://modhb.uni-kl.de/>) Homepage (/)

Notes on the module handbook of the department Mechanical and Process Engineering

Die hier dargestellten veröffentlichten Studiengang-, Modul- und Kursdaten des Fachbereichs Maschinenbau und Verfahrenstechnik ersetzen die Modulbeschreibungen im KIS und wurden mit Ausnahme folgender Studiengänge am 28.10.2020 verabschiedet.

Ausnahmen:

- BSc. Bio- und Chemieingenieurwissenschaften (Stand WS 20/21): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_BSc_BCI.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_BSc_BCI.pdf)
- BEd. Lehramt Metalltechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Bachelor_Lehramt_Metalltechnik.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Bachelor_Lehramt_Metalltechnik.pdf)
- MSc. Bio- und Chemieingenieurwissenschaften (Stand WS 20/21): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_Msc_BCI.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MH_Msc_BCI.pdf)
- MEd. Lehramt Metalltechnik Werkstoffe und Fertigung (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Werkstoffe_und_Fertigung.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Werkstoffe_und_Fertigung.pdf)
- MEd. Lehramt Metalltechnik Maschinen- und Fahrzeugtechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Fahrzeugtechnik.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Fahrzeugtechnik.pdf)
- MEd. Lehramt Metalltechnik Verfahrenstechnik (Stand WS 19/20): https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Verfahrenstechnik.pdf (https://www.mv.uni-kl.de/fileadmin/mv/Studium_Lehre/Modulhandbuecher/MHB_Master_Lehramt_Metalltechnik_-_Verfahrenstechnik.pdf)

Module MV-BioVT-M102-M-4

Bioprocess Engineering I (M, 8.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-BioVT-M102-M-4	<i>Bioprocess Engineering I</i>	8.0 CP (240 h)

Basedata

CP, Effort	8.0 CP = 240 h
Position of the semester	2 Sem. from WiSe/SuSe
Level	[4] Bachelor (Specialization)
Language	[DE/EN] German or English as required
Module Manager	Ulber, Roland, Prof. Dr. (PROF DEPT: MV) (/staff/297/)
Lecturers	Ulber, Roland, Prof. Dr. (PROF DEPT: MV) (/staff/297/)
Area of study	[MV-BioVT] Bioprocess Engineering
Reference course of study	[MV-88.805-SG] M.Sc. Biological Process Engineering (/mhb/FB-MV/cos-558/)
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V	MV-BioVT-86437-K-4	P	-	PL1	3.0	WiSe
2V+1U	MV-BioVT-86432-K-7	P	-	PL2	5.0	SuSe

- About **[MV-BioVT-86437-K-4]**: Title: "Biotransformation and Biocatalysis"; Presence-Time: 28 h; Self-Study: 62 h
- About **[MV-BioVT-86432-K-7]**: Title: "Bioprocess Engineering II"; Presence-Time: 42 h; Self-Study: 108 h

Examination achievement PL1

- Form of examination: **written or oral examination**
- Examination Frequency: each semester
- Examination number: 10437 ("Biotransformation and Biotechnology")

written (120 minutes) or oral (30 minutes) examination

Examination achievement PL2

- Form of examination: **oral examination (30 Min.)**
- Examination Frequency: each semester
- Examination number: 10432 ("Bioprocess Engineering II")

Evaluation of grades

All partial module examinations have to be passed. The module grade is the weighted average of the partial examination grades according to the following weights:

Biotransformation and Biocatalysis 3/8, Bioprocess Engineering II 5/8

Contents

From **[MV-BioVT-86437-K-4] Biotransformation and Biocatalysis** (/mhb/courses/MV-BioVT-86437-K-4/):

- Introduction (Definition of Biocatalysis/Biotransformation; History of Biocatalysis)
- Biosynthesis, structure and mode of action of enzymes

- Extraction and production of enzymes
- Nomenclature and enzyme classes
- Immobilization of enzymes
- Kinetics of enzymatic reactions
- Regulation & inhibition of enzymatic reactions
- Optimization of enzymes
- Reactors for Biocatalysis & Biotransformation
- General applications; Co-substrate recycling
- Industrial applications of oxidoreductases
- Industrial applications of transferases
- Industrial applications of hydrolases
- Industrial applications of lyases
- Industrial applications of isomerases
- Industrial applications of ligases
- Whole cell biotransformations

From [MV-BioVT-86432-K-7] Bioprocess Engineering II (/mhb/courses/MV-BioVT-86432-K-7/):

The module is divided into two equally weighted blocks. In the first block special procedures of bioprocess technology are discussed:

- Cultivation of plant cells (auxotrophic and phototrophic)
- Animal cell cultures
- Insect cells
- Marine Biotechnology
- Single-Use Systems
- Industrial Biocatalysis

In the second block, the following topics are covered:

- Principles of bioprocess modelling
- Introduction to Berkeley Madonna
- Examples of dynamic bioprocess simulation
- Evaluation of bioprocesses under the aspect of sustainability
- Introduction to SuperProDesigner
- Case studies

Competencies / intended learning achievements

From [MV-BioVT-86437-K-4] Biotransformation and Biocatalysis (/mhb/courses/MV-BioVT-86437-K-4/):

The students are able

- to describe the use of isolated enzymes and whole cell systems in technical systems
- to explain the structure and function of enzymes
- to calculate kinetic quantities of enzymatic reactions
- to analyze enzymatic inhibitions
- to independently design and calculate biocatalytic processes
- to explain immobilization procedures
- to present and to advise on the development of a biocatalytic process

From [MV-BioVT-86432-K-7] Bioprocess Engineering II (/mhb/courses/MV-BioVT-86432-K-7/):

1. Lecture

The students are able

- to realize technical bioprocesses with different cell systems
- to evaluate the use of animal cell cultures in human protein production
- to explain differences between prokaryotic and eukaryotic production systems

- to combine biological system parameters with process engineering parameters and to calculate processes independently
- to name process strategies using phototrophic organisms.
- to explain and analyze complex biotechnological processes

2. Exercise

The students are able

- to model and simulate bioprocesses with appropriate software tools
- to analyze and independently set up complex modeling and simulation of bioprocesses
- to present and discuss their results in the exercise group
- to assign kinetic parameters to different bioprocesses

Literature

From [MV-BioVT-86437-K-4] **Biotransformation and Biocatalysis** (/mhb/courses/MV-BioVT-86437-K-4/):

Will be announced during the event.

From [MV-BioVT-86432-K-7] **Bioprocess Engineering II** (/mhb/courses/MV-BioVT-86432-K-7/):

- I.J. Dunn, E. Heinzle, J. Ingham, J.E. Prenosil; *Biological Reaction Engineering*; Wiley-VCH ISBN 3-527-29776-6
- E. Heinzle, A. Biber, C. Cooney; *Development of Sustainable Bioprocesses*; Wiley ISBN-10 0-470-01559-4

Requirements for attendance (informal)

In-depth knowledge of bioprocess technology (e.g. through corresponding B.Sc. degree)

Requirements for attendance (formal)

None

References to Module / Module Number [MV-BioVT-M102-M-4]

Course of Study	Section	Choice/Obligation
[MV-88.805-SG] M.Sc. Biological Process Engineering (/mhb/FB-MV/cos-558/)	Pflichtmodule	[P] Compulsory
Module-Pool	Name	
[MV-ALL-MPOOL-6 (/mhb/modulepools/MV-ALL-MPOOL-6/)]	Wahlpflichtmodule allgemein	