

# **Module Guide**

## **Master Biotechnology (MBT)**

## Module Guide Master Biotechnology

Page 1 of 15

### Table of contents

<b>MBT</b>	<b>Modules</b> .....	<b>2</b>
MBT-11	Biotechnological Processes from Lab to Market .....	3
MBT-12	Safety and Control in Biotechnology .....	6
MBT-13	Bioeconomy .....	8
MBT-14	Non-Technical Competences .....	11
MBT-21	Food and Environmental Biotechnology .....	13
MBT-31	Master's Thesis .....	14

## Module Guide Master Biotechnology

Page 2 of 15

### Modules

Associated with: Degree program MBT Master Biotechnology

Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	90.0	Semester h/wk:	0.0

#### Associated modules

MBT-11	Biotechnological Processes from Lab to Market
MBT-12	Safety and Control in Biotechnology
MBT-13	Bioeconomy
MBT-14	Non-Technical Competences
MBT-21	Food and Environmental Biotechnology
MBT-31	Master's Thesis

## Module Guide Master Biotechnology

<b>Module MBT-11 Biotechnological Processes from Lab to Market</b>			
Module coordinator:	N.N.		
Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	10.0	Workload (h):	300
Rec. semester:	MBT 1	Contact time (h):	120
Dur. of module (semester):	1	Self-study/group work (h):	180
Type of instruction:	Lecture/lab	Semester h/wk:	8.0
Frequency:	Annually (ws)	Group size:	1

Associated exams	1010	Biotechnological Processes from Lab to Market
	1015	Biotechnological Processes from Lab to Market - Lab

## Lessons

**M+V580****Biotechnological Process from Lab to Market**

Course type: Lecture

Sem. h/wk: 4.0

Learning content:

- literature studies
- market survey
- bioprocess engineering principles, including modeling and simulation
- regulatory affairs
- dealing with customers and authorities

Literature :

- Doran, P.M.: Bioprocess Engineering principles, second edition, Elsevier 2013
- Villadsen, J.; Liden, G.; Nielsen, J.: Bioreaction Engineering Principles, Springer 2011
- Dunn, I.J.; Heinzle, E.; Ingham, J.; Prenosil, J.E.: Biological Reaction Engineering, Wiley-VCH, 2003
- Dutta, R.: Fundamentals of Biochemical Engineering. Springer 2008
- Chmiel, H.: Bioprozesstechnik, Elsevier Spektrum Akademischer Verlag, 2006

**M+V581****Biotechnological Process from Lab to Market - Lab**

Course type: Lab

Sem. h/wk: 4.0

Learning content: Students develop and perform a biotechnological production process, including

- feasibility study
- concept development
- safety and authority considerations and management
- basic design and detail engineering

- realization in lab scale, including upstream processing, fermentation, downstream processing, analytics and quality control
- presentation to decision makers

## Literature :

- Doran, P.M.: Bioprocess Engineering Principles, second edition, Elsevier 2013
- Villadsen, J.; Liden, G.; Nielsen, J.: Bioreaction Engineering Principles, Springer 2011
- Dunn, I.J.; Heinzle, E.; Ingham, J.; Prenosil, J. E.: Biological Reaction Engineering, Wiley-VCH, 2003
- Dutta, R.: Fundamentals of Biochemical Engineering. Springer 2008
- Chmiel, H.: Bioprozesstechnik, Elsevier Spektrum Akademischer Verlag, 2006

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 Program Focus
 

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 Applikation of the Module

Master MBT

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 Prerequisites

Basics of biotechnology and process engineering

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 Learning Target

Students are equipped with comprehensive understanding of all process steps relating to bioproducts of industrial importance.

They are able to define and assess the procedures for biomanufacturing. They know how to select the appropriate process steps and how to evaluate process alternatives.

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 Credits and Grades

Written examination (90 min) and laboratory report(s)

The module grade is the product of the individual course grades multiplied with the respective C, divided by the total C of 10 for the module.

**Module Guide Master Biotechnology**

Page 5 of 15

**Examination Biotechnological Processes from Lab to Market**

Associated with: Module MBT-11 Biotechnological Processes from Lab to Market

Examination no.:	1010	Examination type:	written exam 90
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**Examination Biotechnological Processes from Lab to Market - Lab**

Associated with: Module MBT-11 Biotechnological Processes from Lab to Market

Examination no.:	1015	Examination type:	lab work
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**Module Guide Master Biotechnology**

<b>Module MBT-12 Safety and Control in Biotechnology</b>			
Module coordinator:		N.N.	
Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	4.0	Workload (h):	120
Rec. semester:	MBT 1	Contact time (h):	60
Dur. of module (semester):	1	Self-study/group work (h):	60
Type of instruction:	Lecture	Semester h/wk:	4.0
Frequency:	Annually (ws)	Group size:	1

Associated exams	1020	Regulatory affairs and Safety in Biotechnology
	1025	Process Control Engineering

Lessons

<b>M+V582</b>	<b>Regulatory Affairs and Safety in Biotechnology</b>
Course type:	Lecture
Sem. h/wk:	2.0
Learning content:	Students get to know the regulatory systems and safety management when dealing with biological agents.
	Biosafety and Biosecurity survey
	Biosafety level guidelines
	Authority management
Literature :	<ul style="list-style-type: none"> <li>• Satesh, M. K.: Bioethics and Biosafety, I K International Publishing House Pvt. Ltd 2008</li> <li>• Latest edition of respective laws and regulations</li> </ul>
	<a href="http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf">http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf</a>

<b>M+V916</b>	<b>Process Control Engineering</b>
Course type:	Lecture
Sem. h/wk:	2.0
Learning content:	<ul style="list-style-type: none"> <li>• the automation pyramid</li> <li>• norms and regulations</li> <li>• the most relevant DCS systems</li> <li>• sensors and actuators</li> <li>• fieldbus systems</li> <li>• controller and DCS levels</li> </ul>
Literature :	<ul style="list-style-type: none"> <li>• Schildt, H.-H.; Kastner, W.: Prozeßautomatisierung; Springer, 1998</li> <li>• Polke, M. (ed.): Process Control Engineering; VCH Weinheim 1994</li> <li>• Siemens: Manual of Siemens Simatic PCS 7, part 1 and 2</li> <li>• Available online:</li> </ul>

**Module Guide Master Biotechnology**

www.pacontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part1.pdf  
 www.pacontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part2.pdf

Applikation of the Module	Master MBT
Prerequisites	Bachelor's level in control engineering, knowledge in process engineering
Learning Target	Students have obtained comprehensive knowledge of safety and process control in bioengineering.
Credits and Grades	Written examinations (60 min) and oral examination  The module grade is the product of the individual course grades multiplied with the respective C, divided by the total C of 4 for the module.

<b>Examination Regulatory affairs and Safety in Biotechnology</b>			
Associated with: Module MBT-12 Safety and Control in Biotechnology			
Examination no.:	1020	Examination type:	oral examination

<b>Examination Process Control Engineering</b>			
Associated with: Module MBT-12 Safety and Control in Biotechnology			
Examination no.:	1025	Examination type:	written exam 60



## Module Guide Master Biotechnology

## Module MBT-13 Bioeconomy

Module coordinator:		Prof. Dr. rer. nat. Christiane Zell	
Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	10.0	Workload (h):	300
Rec. semester:	MBT 1	Contact time (h):	120
Dur. of module (semester):	1	Self-study/group work (h):	180
Type of instruction:	Lecture/seminar/lab	Semester h/wk:	8.0
Frequency:	Annually (ws)	Group size:	1

Associated exams	1030	Bioenergy
	1035	Bioenergy - Lab
	1040	Biobased Industry

## Lessons

**M+V583****Bioenergy**

Course type: Lecture

Sem. h/wk: 2.0

Learning content:

- Biogas process: Engineering aspects, biological stages, economic and ecological aspects, current research topics
- Biotechnological ethanol process: Microbiological background, application, current research topics
- Biotechnological acetone/butanol process
- Research in biotechnological conversion processes: Microbial fuel cells, microalgae technology (cultivation, oil production)

Literature :

- Khanna, M. (ed.); Scheffran, J.; Zilberman, D.: Handbook of Bioenergy Economics and Policy; E-book; Springer, New York, 2010
- Deublein, D.; Steinhauser, A.: Biogas from Waste and Renewable Resources; Wiley-VCH, Weinheim, 2<sup>nd</sup> ed. 2010
- Blaschek, H.-P.; Ezeji, T.; Scheffran, J.: Biofuels from Agricultural Wastes and By-Products; Wiley Blackwell, 2010
- Vertes, A. (ed.); Qureshi, N.; Yukawa, H.; Blaschek, H.-P.: Biomass to Biofuels: Strategies for Global Industries; Wiley, 2010

**M+V584****Bioenergy - Lab**

Course type: Lab

Sem. h/wk: 2.0

**Module Guide Master Biotechnology**

Learning content: Students enhance their theoretical knowledge with practical aspects of exemplary bioenergy production processes.

Literature : 

- Cholostiakow, T. (2017): In-situ Methanation in Biogas Reactors with regulation of Hydrogen Production Rate and pH control by addition of inorganic buffer. Master'sThesis Hochschule Offenburg

**M+V585**

**Biobased Industry**

Course type: Lecture/seminar

Sem. h/wk: 4.0

Learning content: Students get to know current topics of bioeconomy.

Literature :

- Lewandowsky, I.: Bioeconomy. Springer; 1st ed. 2018
- OECD: The Bioeconomy to 2030. 2009

Applikation of the Module

Master MBT

Prerequisites

Bioenergy fundamentals and basic laboratory skills

Basics of biology and bioengineering

Learning Target

Students know trends, perspectives and limits of the future biobased economy. They understand the close relationship between energy, raw materials, end products, processes, equipment, and process control, and can apply their knowledge in research and development as well as production.

Credits and Grades

Written examination (60 min), laboratory report(s) and presentation and defense

The module grade is the product of the individual course grades multiplied by the respective C, divided by the total C of 10 for the module.

**Examination Bioenergy**

Associated with: Module MBT-13 Bioeconomy

Examination no.: 1030

Examination type: written exam 60

**Examination Bioenergy - Lab**

Associated with: Module MBT-13 Bioeconomy

Examination no.: 1035

Examination type: lab work

**Module Guide Master Biotechnology**

**Examination Biobased Industry**

Associated with: Module MBT-13 Bioeconomy

Examination no.:	1040	Examination type:	oral presentation
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**Module Guide Master Biotechnology**

**Module MBT-14 Non-Technical Competences**

Module coordinator:		Prof. Dr. rer. nat. Christiane Zell Prof. Torsten Schneider, Ph.D.	
Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	6.0	Workload (h):	180
Rec. semester:	MBT 1	Contact time (h):	90
Dur. of module (semester):	1	Self-study/group work (h):	90
Type of instruction:	Seminar	Semester h/wk:	6.0
Frequency:	Annually (ws)	Group size:	1

Associated exams 1050 Bioperspectives and Bioethics

Lessons

**M+V586 Bioperspectives and Bioethics**  
 Course type: Seminar  
 Sem. h/wk: 2.0

Applikation of the Module Master MBT

**Learning Target**

The students know important trends and ethical issues in biotechnology.

They understand the context of engineering and technology, economy, ecology and ethics, and accept it as a foundation of their future professional conduct. They will gain an understanding of variation and uncertainty and how it affects the performance of business, commerce and manufacturing. They will understand the fundamentals of a learning organization, what influences the way people behave, and appreciate how all of this fits into the systemic whole.

**Credits and Grades**

In addition to the mandatory course (Bioperspectives and Bioethics), students declare which courses with a total of 4 C to be included in the module. The module grade is the product of the individual course grades multiplied by the respective C, divided by the total C of 6

for the module. Additional courses can be listed in the transcript of records, without counting towards the module grade or total grade.

**Examination Bioperspectives and Bioethics**

Associated with: Module MBT-14 Non-Technical Competences

Examination no.:	1050	Examination type:	oral presentation
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## Module Guide Master Biotechnology

**Module MBT-21 Food and Environmental Biotechnology**

Module coordinator:	Dr. Hab. Eng. Agnieszka Cydzik- Kwiatkowska (Mrs.), UWM		
Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	30.0	Workload (h):	900
Rec. semester:	MBT 2	Contact time (h):	445
Dur. of module (semester):	1	Self-study/group work (h):	455
Type of instruction:	Lecture/seminar/lab	Semester h/wk:	0.0
Frequency:	Annually (ss)	Group size:	1

Associated exams 2010 Food and Environmental Biotechnology

Applikation of the Module Master MBT

Learning Target Upon completion of the module the students will be able to:  
 create and develop strategies that reflect the interdisciplinary nature of science, regulation and enterprise in the environmental and food biotechnology and deliver working knowledge of the various steps in the development of an environmental and food biotechnology- derived product from inception to the final product.

Credits and Grades Written examination (90min.), written examination (60min.), written test (60min.), written test (90min.), scientific homework, oral presentation, laboratory report(s).

The module grade is the product of the individual course grades multiplied with the respective C, divided by the total C of 10 for the module.

**Examination Food and Environmental Biotechnology**

Associated with: Module MBT-21 Food and Environmental Biotechnology

Examination no.:	2010	Examination type:	diverse
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**Module Guide Master Biotechnology**

**Module MBT-31 Master's Thesis**

Module coordinator:

Prof. Dr. rer. nat. Christiane Zell

Degree program:	Master Biotechnology	Degree:	Master
ECTS-credits:	30.0	Workload (h):	900
Rec. semester:	MBT 3	Contact time (h):	-
Dur. of module (semester):	1	Self-study/group work (h):	900
Type of instruction:	Thesis/seminar	Semester h/wk:	0.0
Frequency:	Every sem.	Group size:	1

Associated exams	3010	Master's Thesis
	3015	Presentation and Defense

Applikation of the Module                      Master MBT

**Learning Target**

The Master's thesis allows the student to demonstrate his or her ability to independently handle a scientific project from the area of process engineering within a limited period of time by means of scientific methods.

The final thesis is defended by the student with an oral presentation of about 15 minutes, plus a discussion of about 10 minutes. The discussion constitutes a final oral examination.

**Credits and Grades**

The grade of the written thesis is the unrounded mean value of the assessments by the supervising university professor and a second (internal or external) supervisor.

The module grade is determined by the supervisors as follows:

- o 80% for assessment of written thesis
- o 20% for presentation and defense of thesis

**Module Guide Master Biotechnology**

Page 15 of 15

**Examination Master's Thesis**

Associated with: Module MBT-31 Master's Thesis

Examination no.:	3010	Examination type:	thesis
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**Examination Presentation and Defense**

Associated with: Module MBT-31 Master's Thesis

Examination no.:	3015	Examination type:	oral presentation
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